Annales Mycologici

Editi in notitiam Scientiae Mycologicae Universalis

Vol. VI. | No. 5. | Oktober 1908.

The Geoglossaceae of North America*).

By Elias J. Durand.

(With Plates V—XXII.)

The *Geoglossaceae* form a group of discomycetous fungi usually associated with the helvellas and morchellas. According to Schroeter's[1]) arrangement it is one of the three families of the *Helvellineae*, the other two being the *Helvellaceae* including plants of the *Helvella*- and *Morchella*-type, and the *Rhizinaceae* including *Rhizina*, *Sphaerosoma* etc. In the system proposed by Boudier[2]) the family is widely removed from the above groups, falling in the Inoperculés, associated with plants of the *Helotium*- and *Mollisia*-type, in which the ascus opens by a pore. In my opinion the latter is the more natural position.

The *Geoglossaceae* include plants of two general types of form. The *Geoglosseae* are mostly club-shaped or clavate in outline *(fig. 121)*, the asci arising directly from the surface of the clavula and forming a uniform stratum over it. They remind one strongly of the simple clavarias. In fact the earlier mycologists before the time of Persoon placed most of the then known species in the large genus *Clavaria* on account of this similarity in form. The *Cudonieae*, on the other hand, are mostly pileate *(fig. 216)*, the upper or superior surface being ascigerous, and the lower

*) Contribution from the Department of Botany, Cornell University no. 132.

[1]) Krypt.-Fl. von Schlesien 3^2: 16. 1893; Nat. Pfl. 1^1: 163. 1894.

[2]) Discomycètes d'Europe 85—91. 1907. Cfr. also Lagarde, Ann. Myc. 4: 217—250. 1906.

or inferior one sterile. The single sessile genus *Apostemidium* forms a connecting link between this group and the *Mollisiaceae*.

In the great majority of species the hymenium covers only a part, usually the upper portion of the ascoma. In *Gloeoglossum*, however, especially in *G. difforme* (Fr.) Durand, while most of the asci are at the upper end of the club, the whole surface is potentially ascigerous. The paraphyses cover the entire ascoma, and scattered asci may be found among them even at the very base of the club *(figs. 151, 160, 162)*. In the other two species of the genus the distinction between ascigerous portion and stem is more marked. Although the paraphyses cover the entire stem to its base I have not yet detected asci among them.

Most of the species are plants of fleshy consistency, but usually elastic or fibrous rather than brittle. A few like *Cudonia* are distinctly leathery in texture, while others are decidedly gelatinous. Saccardo has placed the leotias in the *Bulgariaceae* on this account, but other undoubted members of the family, notably the gloeoglossums, are distinctly gelatinous when fresh. The vibrisseas and apostemidiums are rather soft and semigelatinous as would be expected from their peculiar habitat.

The plants of this family are composed almost entirely of hyphae. In some genera (e. g. *Geoglossum*) these are stout, more or less parallel and rather closely septate. In longitudinal section such tissues look like a pseudoparenchyma. In others (e. g. *Leotia*) the threads are slender and more loosely interwoven. Mr. Massee would limit the family to species formed entirely of hyphae, but this criterion would exclude the cudonias and vibrisseas in which there is a distinct pseudoparenchymatous cortex.

Regarding the development of members of the family very little is known. Brefeld[1]) made cultures of "*Geoglossum hirsutum*, *G. glutinosum*, *Mitrula viridis*, *M. phalloides* and *Leotia lubrica*", but germination took place only in *M. phalloides* with the production of a white mycelium. No imperfect or conidial condition has been observed. I have undertaken no cultural experiments, but several facts have come to my notice which may be worth mentioning since our information on the subject is so meagre. In *Spathularia* and *Cudonia* it is not unusual to see asci which are filled with small, elliptical, spore-like bodies strongly suggestive of the condition in *Tympanis*, *Biatorella* and other genera with "polysporous" asci. One does not need to look far to find the origin and nature of these bodies. One rarely makes a preparation of one of these genera without seeing ascospores to the sides of which numerous little bodies are attached by short lateral processes. This condition is exactly comparable with that observed in many ascomycetes, in which the ascospores on germination put forth very short germ-tubes which immediately begin to throw off secondary conidia. (Compare Brefeld l. c. *pl. 5 f. 45—46; pl. 6 f. 34* &c.) In the

[1]) Bot. Untersuch. **10**: 339—340.

case of *Cudonia* and *Spathularia* the spores germinate while still within the ascus, and the conidia are produced until the ascus is completely filled and the original ascospores obliterated.

The question of the origin of the hymenium in the *Geoglossaceae* is of much interest. Until quite recently it has been supposed that the hymenium was not covered by any special membrane as in the other discomycetes, but was free and exposed from its youngest stages. Schroeter (l. c.) made this condition the distinguishing character of the *Helvellineae*. So far as I have been able to learn, this supposition has been based on general observation rather than on any special investigation of the subject. The first definite evidence to the contrary was presented by Dr. Gustav Dittrich[1]), based upon an examination of young ascomata of *Mitrula phalloides* and *Leotia gelatinosa (L. lubrica)*. His observations showed that in both species the young hymenium is at first completely enveloped by a special membrane comparable to the volva of the *Agaricineae*, so that the hymenium in these plants is endogenous in its origin rather than exogenous as had been previously supposed.

Observations of my own on several different species, made before I learned of Dr. Dittrich's work, point unmistakeably to the same conclusion. Sections of *Mitrula phalloides* made from ascomata as small as 1 mm in height show a distinct veil, composed of slender interwoven hyphae, which are of the same character as those forming the ectal layer of the stem, and directly continuous with them. The membrane disappears early by breaking up into fragments, so that it must be studied in the very youngest plants.

Microglossum viride is a more favorable species for study. The veil, although best seen in young ascomata, has been observed covering an ascigerous portion 4 mm long. In this species as well the hyphae composing the veil are continuous with and of the same character as those of the ectal layer of the stem. Moreover, it is studded with lumps or squamules exactly similar to those borne on the surface of the stem. While the veil seems to break up into fragments there are indications that the hymenium first appears through a pore at the apex.

The most conspicuous veil by far is seen in *Cudonia lutea* and *Spathularia velutipes*. In both species it persists until the plants are one-third or even one-half grown, when it cracks into irregular scales and falls away *(figs. 219, 222)*. In the fresh mature plant one can usually detect its irregular free edge at the line of junction of the stem with the hymenium. In both species the veil is continuous with the ectal layers of the stem, and bears on its surface the roughenings characteristic of the surface of the stem. In *Cudonia* these cause it to appear

[1]) Zur Entwickelungsgeschichte der Helvellineen. Cohn's Beiträge. 8: 17—52. *pl. 4, 5.* 1898.

farinaceous, while in the *Spathularia* the whole young plant is velvety from the projecting bay-brown hairs. In the latter the veil appears to rupture first by a crack running around the plant just above the stem. The contrast in color between the bay-brown surface and the ochraceous hymenium beneath is very pretty and conspicuous.

Whether this veil is present in all the members of the family can be determined only by the examination of a large number of species in the young state. Sections of quite young ascomata of *Geoglossum glabrum*, *Gloeoglossum difforme* and *Trichoglossum velutipes* have shown no traces of such a membrane. Since, however, it has been demonstrated in five genera, representing both sections of the family, viz. *Mitrula*, *Microglossum*, *Spathularia*, *Leotia* and *Cudonia*, it seems probable that it will be found in all when they shall be examined in the proper state of development. The following quotation from Phillips would seem to indicate that in *Vibrissea*, too, the hymenium is not free from the first: „When a plant of *Vibrissea truncorum* is approaching its maturity the hitherto cylindrical stem begins to enlarge at the summit, and the cortical tissue opens at a point in the center, through which the paler medullary tissue may be seen forcing its way to the light, preparing to give rise to the hymenium." I believe that when the development of the discomycetes shall be better understood it will be found that in none of them, not even in the *Helvellaceae*, is the hymenium „exposed from the first".

The majority of the *Geoglossaceae* grow in damp or moist situations, and are to be found most commonly in low wet woods or swamps or on the shady slopes of ravines. The character of the substratum inhabited varies, of course, with the species. It is possible, however, to indicate the following general kinds of substratum together with the species which grow most commonly or most luxuriently upon them.

1. Rotten wood, logs, stumps etc., usually much decayed. *Microglossum rufum*, *M. fumosum*, *Gloeoglossum difforme*, *Geoglossum glabrum*, *G. alveolatum*.

2. Soil covered with rich humus, decaying moss, leaves etc. *Microglossum longisporum*, *M. olivaceum*, *Corynetes atropurpureus*, *Gloeoglossum glutinosum*, species of *Trichoglossum*, *Leotia lubrica*, *L. stipitata*.

3. Sandy or loamy soil usually without humus. *Microglossum viride*, *Leotia chlorocephala*, *Geoglossum fallax*, *Corynetes arenarius*. Also *Leotia lubrica* and *L. stipitata*.

4. Soil under coniferous trees, covered with needles etc. *Mitrula irregularis*, *Gloeoglossum difforme*, species of *Spathularia*.

5. Dead wood, leaves, moss etc., wholly or partly submerged in water. *Mitrula phalloides*, the species of *Vibrissea* and *Apostemidium*.

6. Dead beech leaves not much decayed. *Cudonia lutea*.

7. Dead coniferous leaves. *Mitrula cucullata*.

8. Living moss. *Mitrula gracilis* and *M. muscicola*.

As is the case with other fleshy fungi *Geoglossaceae* vary in abundance with the character of the season. They reach their highest development both in numbers and luxurience in seasons of prolonged rainfall. But this is not the only factor. The species have a strange way of being abundant throughout one season, but almost entirely absent the next, although weather conditions may seem to be the same. Why this is so cannot be explained until more is known about the life history of these plants, and about the conditions affecting their growth and development. Some species as *Microglossum viride* may be found in the same spot year after year.

As far as one can judge from the material examined and from correspondence with collectors in various parts of the country, *Geoglossaceae* seem to be most abundant in the Atlantic states, or, at least, in the states east of the Mississippi River. Furthermore, the group seems to reach its highest development in regions in which coniferous vegetation abounds. This being the case it is rather surprising that so few species have been collected in the North West where coniferous forests predominate. It is highly probable that when that interesting region is more thoroughly explored by mycologists a large number of forms will be brought to light. America is already known to possess a geoglossaceous flora of unsurpassed richness, and when we consider the large number of new forms which have been brought to light in a limited area in New York State, we may conclude that the future has much in store for the careful mycologist.

It has already been stated that most of the fungi now included in the *Geoglossaceae* were formerly placed in the large genus *Clavaria*. In 1794, Persoon described the four genera *Mitrula*, *Leotia*, *Geoglossum* and *Spathularia*. Since then groups have been split off from time to time, principally from *Leotia* and *Geoglossum*, until now more than a dozen genera are recognized, which range from the arctic regions to the tropics.

Systematic treatment of the American *Geoglossaceae* has been a development of the last thirty years. In 1875, M. C. Cooke prepared a Synopsis Helvellaceorum Pileatorum[1]) in which the known American species were enumerated and some described. In the same year he published a Revision of *Geoglossum*[2]), in which the fruit characters of several species were given with mention of several American forms. The same author produced in Mycographia (1875—1879) descriptions and colored figures of most of the known species. This work has remained for many years the standard reference book on the subject, and its interpretations have been followed almost universally.

---

[1]) Hedw. **14**: 7—10. 1875.
[2]) Grev. **3**: 133—134. 1875.

During the last decade the group has received considerable attention from students. In 1896[1]), Dr. Underwood prepared a synopsis of the *Helvellales*, arranged according to the Engler & Prantl system. Little attempt was made to do more than present a list of the described species with localities. Mr. Geo. Massee[2]) has given us an extensive monograph of the *Geoglossaceae* of the world, with careful descriptions of the American species known to him. While this is the most elaborate and complete monograph of the group yet attempted, the treatment of the American forms is in many respects unsatisfactory on account of the author's enforced unfamiliarity with living material, and the limited number of specimens at his disposal. Dr. Burt[3]), in 1899, gave descriptions and figures of the species represented in Vermont, and Miss Hone[4]) has recently done the same for Minnesota.

Nearly all the prominent American mycologists have contributed to our knowledge of this group. I cannot, however, refrain from mentioning the name of Dr. C. H. Peck, who during his activity as a mycologist, covering a period of nearly 40 years, has done more, perhaps, than anyone else to bring to light the many interesting fungi which occur within our limits.

The present paper is the outcome of attempts made from time to time to determine satisfactorily the numerous specimens which have come to hand. It became apparent after a very little study that all treatments of the American forms were at best incomplete, and that a revision was sadly needed. I determined, accordingly, to undertake a critical examination of all available material in the hope of effecting a more satisfactory arrangement of the group.

Much emphasis has been placed upon study of fresh material in the field. During the last few years I have had opportunity to study this group in two regions which I believe to be unsurpassed in the abundance and variety of their mycological flora. In the summer of 1901 I spent two months collecting discomycetes in the mountains of western North Carolina, where material was abundant, especially of species of the *Geoglossum*-group and of *Leotia*. The season of 1902 was exceptionally favorable to the development of *Geoglossaceae* in the vicinity of Ithaca, N. Y. With the assistance of a group of enthusiastic graduate students who were studying mycology in the laboratory at Cornell, I was able to see and to photograph a considerable number of species in the fresh state, and

---

[1]) On the Distribution of the North American Helvellales. Minn. Bot. Studies. **1**: 483—500. 1896.

[2]) A Monograph of the Geoglosseae. Ann. Bot. **11**: 255—306. *pl. 12—13*. 1897.

[3]) A List of Vermont Helvelleae with Descriptive Notes. Rhodora. **1**: 59—67. *pl. 4*. 1899.

[4]) Minnesota Helvellineae. Minn. Bot. Studies. **3**: 309—320. *pl. 48—52*. 1904.

to get notes from an abundance of material from many stations. As a result of several seasons' work on fresh material I am able to present descriptions of a majority of our species drawn from the living plants.

Since the North American geoglossaceous flora is so extensive, and so closely related to that of other countries, and since so many of the conclusions found in the literature of the group seem to be uncertain, it soon became evident that an exhaustive study of herbarium material, especially of typical and authentic collections, was needed to place our knowledge on a firm foundation. To this end I have been permitted to examine the *Geoglossaceae* in the herbaria of the following students and institutions:

1. The Rijks Herbarium, Leiden, Netherlands, particularly the herbarium of Persoon, containing the types and authentic specimens of several species (P).

2. The University of Upsala, Sweden, containing the herbarium of Elias Fries, besides numerous specimens from Karsten, Fuckel, Quélet and others (F).

3. The Royal Gardens, Kew, England, with the herbaria of Berkeley and Cooke (K).

4. The New York Botanical Garden containing the Ellis Collection with its large series of specimens from many localities (NY).

5. The New York State Museum of Natural History containing the types described by Dr. Peck as well as many authentic specimens (A).

6. Harvard University (H), including the Curtis Herbarium (C), the collections of Dr. Farlow and others.

7. The collections of Dr. Roland Thaxter consisting of large series of specimens gathered in Maine, New Hampshire, Connecticut, North Carolina, Tennessee, Florida and elsewhere (T).

8. The Schweinitzian Herbarium at the Philadelphia Academy of Natural Science (S).

9. The United States Department of Agriculture (US).

10. The Frost herbarium at the University of Vermont (Fr).

11. The herbarium of Professor Burt, the basis of his paper on Vermont Helvelleae (B).

12. Cornell University containing several valuable exsiccati (CU).

13. The Michigan Agricultural College (MAC).

14. The University of Minnesota with duplicates of most of the specimens mentioned by Miss Hone (M).

15. The University of Nebraska and the Botanical Survey (Neb).

16. The Missouri Botanical Gardens (Mo).

17. The California Academy of Science (Cal), two specimens.

18. The collections of Mr. C. G. Lloyd, of Cincinnati, O. (L).

An extremely interesting collection of about 50 numbers, made by Mr. H. S. Jackson, then of the Botanical Department of Cornell, in cen-

tral New York, in 1904, was also turned over to me for examination. The collections of Prof. J. Dearness, of London, Ontario, and of Mr. C. C. Hanmer, of East Hartford, Conn. contain many specimens of interest.

To the owners or curators of the above mentioned collections, as well as to the various individuals who have sent me specimens, I wish to extend here my most hearty thanks for the courtesies always so generously and cordially extended. But especially do I acknowledge my indebtedness to Dr. J. P. Lotsy, Director of the Rijks Herbarium, Leiden, Netherlands, for generously sending me fragments of 11 specimens in the herbarium of Persoon. These I am assured constitute samples of all the species of the group in that noted collection, and those not sent me are not present there. While a study of these specimens has, in most cases, modified only slightly the previously formed conclusions, yet these conclusions have been placed upon a much firmer basis than has ever before been possible. I count myself most fortunate in being among the first to examine a series of Persoon's types under the microscope, and to embody the results of such study in a scientific paper.

The writer believes that he has examined every collection known to contain material the study of which would contribute materially to the completeness of this paper. Many hundreds of specimens both living and dried have been gone over, the whole not only constituting a wealth of material such as is rarely placed before a monographer, but forming what is probably the most complete series of specimens available at the present time.

In the course of the study the type specimens, or portions of the types, of the following species or varieties have been seen. In many cases cotypes or duplicates of the original collection have been examined in addition to the type.

Corynetes robustus Durand.
Cudoniella fructigena Rostr.
Geoglossum atropurpureum Pers.
„ *cohaerens* Durand.
„ *fallax* Durand.
„ *Farlowi* Cke.
„ *glabrum* Pers.
„ „ var. *vulgare* Pers.
„ *glutinosum* Pers.
„ „ var. *lubricum* Pers.
„ „ var. *minus* Sacc.
„ *hirsutum* Pers.
„ „ var. *americanum* Cke.
Geoglossum intermedium Durand.
„ *irregulare* Pk.
„ *laevipes* Pers. MS.
„ *luteum* Pk.
„ *microsporum* C. & P.
„ *nigritum* Cke.
„ *Peckianum* Cke.
„ *pistillaris* B. & Cke.
„ *pygmaeum* Ger.
„ *rufum* L. v. S.
„ *simile* Pk.
„ *tremellosum* Cke.
„ *velutipes* Pk.
„ *viride* Pers.
„ *Walteri* Berk.
Gloeoglossum affine Durand.

Helotium vibrisseoides Pk.
Leotia chlorocephala L. v. S.
„ *circinans* Pers.
„ *elegans* Berk.
„ *Mitrula* Pers.
„ *ochroleuca* Cke. & Hark.
„ *punctipes* Pk.
„ *Stevensoni* B. & Br.
Leptoglossum alabamense Underw.
„ *alveolatum* (Durand) Rehm.
„ *latum* Pk.
„ *luteum* var. *fumosum* Pk.
Microglossum arenarium Rostr.
„ *contortum* Pk.
„ *longisporum* Durand.
Microglossum obscurum Pk.
Mitrula gracilis Karst.
„ „ var. *flavipes* Pk.
„ *luteola* Ell.
„ *lutescens* B. & C.
„ *macrospora* Mass.
Mitruliopsis flavida Pk.
Patellaria filifera B. & C. MS.
Spathularia flavida var. *californica* Moore.
„ „ var. *rugosa* Pk.
„ *velutipes* Cke. & Farl.
Sprague ola americana Mass.
Vibrissea foliorum Thaxter.
„ *lutea* Pk.
„ *truncorum* var. *albipes* Pk.

Of the following forms only cotypes or portions of the original collection have been examined:

Gorgoniceps turbinulata Rehm.
Leotia chlorocephala var. *Lloydii* Rehm.
Leptoglossum lutescens var. *mitruloides* Rehm.

Of the following forms only authentic specimens not known to be part of the original collection have been examined:

Cudonia confusa Bres.
„ *Osterwaldii* P. Henn.
Geoglossum carneum Schultz.
„ *difforme* Fr.
„ *glabrum* var. *paludosum* Pers.
„ *hirsutum* var. *leotioides* Cke.
„ *pruniforme* Wahl.
„ *purpurascens* Pers.
„ *sphagnophilum* Ehrb.
Geoglossum vitellinum Bres.
Leotia aquatica Lib.
„ *clavus* Pers.
Mitrula globosa Sommf.
„ *Rehmii* Bres.
„ *sclerotipes* Boud.
Peziza aridula Karst.
„ *fiscella* Karst.
Spathularia Neesii Bres.

Of the 53 species or varieties originally described from North American material and referred to this group I have seen either the type, or a portion of the type, or a duplicate of the original collection of 45. Of the remaining 8, 3 (*Geoglossum farinaceum* L. v. S., *Leotia exigua* L. v. S. and *Mitrula inflata* Fr.) are missing from the herbarium of Schweinitz, and none of his specimens are known to be in existence; 2 (*Geoglossum albus* Johnson = *Mitrula Johnsoni* Sacc. and *Spathularia linguatus* Johnson) are inaccessible and probably no longer in existence; 1 (*Tremella stipitata* Bosc = *Leotia viscosa* Fr.) if in existence is not available to me for examination; 1 (*Leotia rufa* Rostr.) was too fragmentary to justify examination,

and 1 (*Mitrula roseola* Morgan) was said by its author to be a lichen. Some of the above are sufficiently striking to be recognizable from the descriptions. The affinities of all will be discussed more at length in the following pages.

In view of the fact that authentic specimens of most of the species have been seen the attempt has not been made to examine all the European exsiccati. Only the more important synonyms and illustrations have been listed. The published records of the distribution of species are at best unreliable. In the interests of accuracy, therefore, only those specimens are mentioned which have been personally examined, and in each case the herbarium is indicated in which the specimen seen is present. A list of these herbaria with abbreviations is given on a previous page. The descriptions are drawn from the material examined, and are all original unless otherwise indicated. All of the drawings and photographs were made by the writer except figures 214 and 215. These two photographs of *Cudonia circinans* were made by Professor G. F. Atkinson, in the spruce forests, at Pontarlier, France, in 1905. I am greatly indebted to him for permission to use them in this paper.

Synopsis of Genera.

A. Ascoma stipitate, clavate or spathulate, the ascigerous portion usually more or less compressed, rarely subglobose . . . . . *Geoglosseae.*

B. Clavate, the ascigerous portion not or only slightly decurrent on opposite sides of the stem.

C. Spores small, elliptical, cylindrical or fusiform, continuous. Plants bright colored . . 1. Mitrula.

C. Spores long-elliptical to cylindrical, 3-many-septate when mature.

D. Ascomata bright colored. . . . . 2. Microglossum.

D. Ascomata black or blackish.

E. Spores hyaline (cfr. *Ge. alveolatum*) . 3. Corynetes.

E. Spores fuliginous or brown.

F. Hymenium without spines or setae.

G. Ascomata viscid-gelatinous; paraphyses continued down the stem . . . . . 4. Gloeoglossum.

G. Ascomata not viscid-gelatinous; paraphyses confined to the hymenium . . . . . 5. Geoglossum.

F. Hymenium beset with spines or setae . . . . . 6. Trichoglossum.

B. Spathulate or fan-shaped, ascigerous portion decurrent on opposite sides of the stem . . . 7. Spathularia.

A. Ascoma stipitate, pileate (or sessile in one genus with filiform spores) . . . . . *Cudonieae.*

H. Spores elliptical-fusiform, ascoma gelatinous . . 8. Leotia.

H. Spores filiform or filiform-clavate.

I. Ascoma fleshy-gelatinous, asci very narrow, spores filiform; plants aquatic or semiaquatic.

J. Stipitate . . . . . 9. Vibrissea.

J. Sessile or turbinate . . . . . 10. Apostemidium.

I. Ascoma fleshy-leathery, asci broadly clavate, spores filiform-clavate; plants terrestrial . . 11. Cudonia.

1. **Mitrula** Pers. Römer's N. Mag. für die Bot. **1**: 116. 1794; Schum. Enum. Sael. **2**: 409. 1803.

Heyderia (Fr.) Boud. Bull. Soc. Myc. Fr. **1**: 110. 1885 (not C. Koch 1873).

Microglossum Boud. l. c. (not. Gill. nor Sacc.).

Ascoma fleshy, erect, stipitate, clavate, the hymenium covering only the upper portion, or the ascigerous portion elliptical to subglobose, usually sharply delimited from the stem and often slightly free from it below, bright colored (usually yellow or brownish); asci clavate-cylindrical, opening by a pore; spores 8, uniseriate or biseriate in the ascus, elliptical to narrowly fusiform, hyaline, continuous or rarely 1-septate when mature; paraphyses present or absent.

Persoon's original description is as follows:

„Pileo conico laevi ad stipitem contracta."

„M. *Heyderi* (Autumn. in pinetis ad terram)."

Although *Mitrula*, as the name of a genus of fungi, dates from Persoon's first paper (1794) it does not appear to have been thus used by him in any of his subsequent publications. The only species, *M. Heyderi*, although poorly figured, was not described by Persoon, nor was it again referred to by him until 1801, when it was listed as a synonym of *Leotia Mitrula* Pers. In 1803, however, Schumacher gave a description of the genus *Mitrula* and its single species, *M. Heyderi* Pers. The type of the genus is, therefore, *M. Heyderi* Pers. = *M. cucullata* (Batsch) Fr.

Massee included in the genus *Mitrula* all of the clavate Geoglossaceae with hyaline, elongated spores. Is seems to me, however, to be much more logical to limit the genus to species having the small spores elliptical to fusiform and continuous or rarely, in some species, 1-septate at maturity.

A. Spores broadly elliptical; paraphyses absent.

B. Ascomata very irregular and contorted; spores 6—10 ⩻ 4—5 μ . . . . . 1. M. irregularis.

B. Ascomata regularly clavate; spores 4—6 ⩽ 3—4 μ 2. M. vitellina.
A. Spores narrowly elliptical, clavate or fusiform; paraphyses present.
C. Ascigerous portion vitelline yellow, stem satiny white . . . . . 3. M. phalloides.
C. Ascigerous portion cream-color to brownish, stem darker, at least not white.
D. Growing on coniferous leaves; ascigerous portion cream-buff when fresh, stem darker . . . . . 4. M. cucullata.
D. Growing on living moss.
E. Hymenium nearly even; when dry ascigerous portion orange-brown, stem paler . . . . 5. M. gracilis.
E. Hymenium more or less convoluted . . . 6. M. muscicola.

1. **Mitrula irregularis** (Peck) Durand. (Figures 7—8.)
Geoglossum irregulare Peck, Rep. N. Y. State Mus. **32**: 45. 1879.
Mitrula vitellina American authors, not Bres. Rev. Myc. **4**: 212. 1882.
Mitrula vitellina Bres. **irregularis* (Pk.) Sacc. Syll. **8**: 36. 1889.
Mitrula luteola Ellis, Am. Nat. **17**: 192. 1883.
Mitrula crispata Berk. Grev. **3**: 149. 1875. (Not Fr.?)
Sprageola americana Mass. Journ. Bot. **34**: 150. 1896.

Illustrations: Bull. N. Y. S. Mus. **1**[2], *pl. 1, f. 5—7*; Rep. N. Y. S. Mus. **48**, *pl. 5, f. 8—14*; Massee, Ann. Bot. **11**, *pl. 12, f. 23—24a*.

Type: in herb. N. Y. S. Mus. Nat. Hist., from Sandlake, N. Y. *(Peck)*.

Plants usually cespitose rarely solitary, clavate, of irregular form, usually twisted or contorted, compressed, obtuse, sometimes lobed, 1,5—5 cm high; ascigerous portion vitelline yellow, commonly occupying $^1/_2$—$^2/_3$ the total length, up to 15 mm broad; stem tapering downward, satiny white, pruinose, fibrillose or thinly tomentose, up to 1.5 cm high, 2—5 mm thick, sometimes absent; substance yellowish white. Asci clavate-cylindrical, the ascigerous hyphae repeatedly branched below, apex rounded, not or slightly blue with iodine, variable in length, 90—150 ⩽ 5—6 μ; spores 8, uniseriate, hyaline, continuous, smooth, elliptical, often slightly reniform, 6—10 ⩽ 4—5 μ (majority 8 ⩽ 5); paraphyses absent.

On bare soil, mossy damp ground, or most often among pine leaves; September—November. Ontario and New Brunswick south to District of Columbia. Most common in the coniferous woods of northern New England and eastern Canada. Dr. Faull reports it as very common in the Algonquin Park and Temagami Forest Reserve, Ontario.

This species has usually been reported in America as *M. vitellina* (Bres.) Sacc., but it seems to me to be distinct from the Tyrolese plant, of which I have specimens, in its clustered habit, larger size, stouter, more irregular ascomata, and in the ascigerous portion being more distinct

from the fibrillose stem. The asci and spores are also larger. (Cfr. *figs. 6* and *7*.)

Mitrula irregularis may be easily mistaken for a yellow Clavaria, especially *C. pulchra* Pk., and I suspect it has often been overlooked on this account. The name is very appropriate as the plants are extremely variable and polymorphic, so that it is scarcely possible to find any two alike. One may see in a single clump individuals with elongated stems associated with others absolutely sessile. It is the latter condition to which Massee has given the name *Spragueola*. In the Curtis herbarium, at Harvard, is a portion of the original specimen, collected in Massachusetts by Sprague, and part of which was sent by Curtis to Berkeley. The latter was referred by him to *Mitrula crispata* Fr., and later became the type of *Spragueola* as above. This type I have seen at Kew. Its true relationship is quite apparent to one acquainted with the many different forms assumed by this variable species.

Material examined.

Ontario: Algonquin Park, *J. H. Faull* (D); East of Georgian Bay, *J. Dearness* (D) (L).

Nova Scotia: Pictou, *W. P. Fraser* (CU).

New Brunswick: St. John, *G. U. Hay* (D).

Maine: Orono, *F. L. Harvey* (D); Eastport, *R. Thaxter* (T); Kennebunk, *H. Webster* (H).

New Hampshire: White Mts., *Miss Minns* (NY); Shelburne, *Dr. Farlow* (NY).

Vermont: Mt. Mansfield, *E. A. Burt* (B).

Massachusetts: *Sprague* (C), type of *Spragueola americana* (K); Arlington, *Falsam* (H).

Connecticut: South Windsor, *C. C. Hanmer* in herb.

New York: Sandlake, *C. H. Peck* (A, type) (NY); North Elba & Rensselaer, *Peck* (A).

New Jersey: Newfield, *J. B. Ellis* (NY, type of *Mitrula luteola* Ell.). Ellis, N. A. F. *n. 978* (CU) (D).

Maryland: Hyattsville, *F. L. Scribner* (US).

District of Columbia: Takoma Park, *T. A. Williams* (NY).

2. **Mitrula vitellina** (Bres.) Sacc. Syll. **8**: 36. 1889. (Figures 5—6.)
Geoglossum vitellinum Bres. Rev. Myc. **4**: 212. 1882.
Microglossum vitellinum (Bres.) Boud. Bull. Soc. Myc. Fr. **1**: 110. 1885.

Illustrations: Bres. Fung. Trident. *pl. 45, f. 1*; Rehm, Disc. 1143; Mass. Ann. Bot. **11**, *pl. 12, f. 3—4a*.

Type: Probably in herb. Bresadola, from the Tyrol.

Plants clavate, 2—3 cm high, "when fresh creamy yellow", when dry yellowish cream-color or brownish in one specimen, ascigerous portion

occupying about $^1/_2$ the total length, about 3 mm wide, compressed, obtuse, not sharply differentiated from the stem; stem terete, somewhat flexuous, equal, about 1 mm diam., whitish, fibrillose. Asci slender, cylindrical, branched below, apex rounded, not blue with iodine, 75—80 $\times$ 5—6 μ; spores 8, uniseriate, hyaline, continuous, smooth, broadly elliptical, 4—6 $\times$ 3—4 μ. Paraphyses absent.

On rotten wood, Rugby, Tennessee, *(M. S. Percival, n. 5)*. Herb. Cornell *n. 14351*.

I have referred this collection to *M. vitellina* in spite of the "creamy" color of the fresh plant and the habitat on "rotten wood". Bresadola has kindly sent me specimens collected in spruce forests in the Tyrol. These are small, regularly clavate plants quite different in general appearance from those of the polymorphic *M. irregularis*. The asci are shorter, are repeatedly branched below, and no paraphyses are present. The spores also are smaller. *No. 14351* is somewhat larger than the European plants but the asci and spores are even smaller. In fact the spores are not much more than half as large as those of *M. irregularis*. (Cfr. *figs. 5, 6* and *7*.)

3. **Mitrula phalloides** (Bull.) Chev. Fl. Paris. 114. 1826—1827. (Figure 185.)
? *Helvella laricina* Vill. Fl. Dauph. **3**: 1045. *pl. 56*. 1789.
Clavaria phalloides Bull. Champ. Fr. 214. *pl. 463, f. 3*. 1791.
Mitrula paludosa Fries, Syst. Myc. **1**: 491. 1821.
Leotia uliginosa Grev. Scot. Crypt. Fl. *pl. 312*. 1828.
Leotia elegans Berk. London Journ. Bot **1846**: 5—6.
Mitrula elegans (Berk.) Fr. Nov. Symb. Myc. 119. 1851.
Mitrula laricina (Vill.) Mass. Ann. Bot. **11**: 271. 1897.

Illustrations: Bull. l. c.; Grev. l. c.; Phill. Brit. Disc. *pl. 2, f. 6*; Gill. Disc. Fr. *pl. 28, f. 1*; Cooke, Mycog. *pl. 45, f. 175*; *pl. 46, f. 182* (called *M. elegans*); Mass. Ann. Bot. **11**. *pl. 13, f. 69*; Rehm, Disc. 1143. *f. 1—4*.

Type: European, probably no longer in existence.

Plants solitary or usually more or less densely gregarious, sometimes as many as 15—20 closely aggregated and cohering at their bases, 2—6 cm or more high, ascigerous portion clear vitelline yellow, sharply differentiated from the stem, at first solid becoming vesiculose or inflated and hollow when old, in outline elliptical, elliptical-obovate or piriform, apex rounded, obtuse, even or somewhat longitudinally furrowed especially below, often somewhat compressed, rarely more than 1/5 the total height of the plant, 0,5—2 cm high, 4—10 mm wide; stem terete, often flexuous, pure satiny white or sometimes with a pinkish tint, 1,5—2 mm thick, smooth, when moist translucent and viscid Whole plant soft and subtremellose. Asci clavate, apex much narrowed, acute, very slightly blue with iodine, long stipitate, 60—150 $\times$ 6—8 μ; spores 8, biseriate, hyaline,

continuous, smooth, contents granular, cylindrical to clavate-cylindrical, 10—18 × 2,5—3 μ; paraphyses filiform, usually branched, septate, scarcely thickened above.

On decaying vegetation, often on or among sphagnum, in wet places, pools and ditches; April—June. Ontario to Alabama west to British Columbia.

A very pretty and characteristic species well known by the white, smooth stem, vitelline yellow head, and small elongated spores. When fresh the plant is very soft and delicate often almost tremellose. The ascomata are usually attached by a thin white tomentum at the base of the stem. I have seen no divided spores in this species, but Massee says they often become 1-septate at maturity. The stem is composed of a fascicle of hyphae about 20 μ thick. Those at the center are looser and finally break down leaving it hollow. The surface is covered with a thin gelatinous layer, the loose component hyphae of which are 5 μ thick. The colors are not entirely lost if the plant is carefully dried, but otherwise it becomes a rather uniform dingy yellowish brown.

Several writers have identified this species with *Helvella laricina* Vill. This conclusion may be well founded, but the brief description and crude figures given by Villars are uncharacteristic to say the least, since they may as well apply to some forms of *Spathularia clavata*. On the other hand Bulliard's figures of *Clavaria phalloides* are characteristic and unmistakeable, so that, in the absence of specimens in both cases, it seems better to employ his name.

I have seen the type of *Mitrula elegans*, at Kew, and am convinced that it nothing more nor less than a very slender condition of the present species. Fries long ago remarked upon the close relationship of the two species, and I have repeatedly seen dried plants of undoubted *M. phalloides* which in form and color exactly match the type specimens of *M. elegans*. The latter has been described as growing on the ground, but a close examination of the type specimens has revealed fragments of sphagnum clinging to the stem at some distance above the base, so that they were, in all probability, growing deep down in the moss. The "forked stem" present in one specimen is a normal condition in *M. phalloides*, in which the stems are commonly agglutinated below.

Leotia elegans was reported from "United States, Mr. Greene", without exact locality. Dr. B. D. Greene was a well known physician of Boston, who collected fungi in that vicinity, and after whom several species were named by Berkeley, e. g. *Cyclomyces Greenei* Berk.

Material examined:

European: Phill. Elv. Brit. *n. 2*; Moug. & Nest. Stirp. *n. 65*; Krieger, Fung. Saxon. *n. 1581*; Thümen, Myc. Univ. *n. 111*. Also specimens from Sweden *(Haglund)*, besides numerous examples in herb. Fries and Kew.

British Columbia: *J. Macoun* (NY); Vancouver Isl., *F. K. Butters* (D).
Ontario: Muskoka, *J. Dearness* (NY) (D).
New Hampshire: *Farlow* (H); East Jeffery, *Miss Minns* (Mo); Chocorua, *W. G. Farlow* (D).
Vermont: Brattleboro? (Fr); Ripton, *E. A. Burt* (B) (D).
Massachusetts: Boston, *Greene n. 66* (K) type of *L. elegans*; Worcester, *G. E. Francis* (B); Middlesex Fells (B).
Rhode Island: Providence, *Bennett* (D).
Connecticut: Litchfield, *Miss V. White* (NY); Marlboro, *C. C. Hanmer* in herb.
New York: Buffalo, *G. W. Clinton* (US); Sandlake & Karner, *Dr. Peck* (A); Adirondack Mts., *Mrs. E. G. Britton* (NY), *Peck* (A); Ithaca, various col. (CU) (D); Ellis in Rav. F. Car. *fasc. 5 n. 36* (NY).
New Jersey: Newfield, *J. B. Ellis* (NY); N. A. F. *n. 433* (CU).
Pennsylvania: West Chester (NY).
Delaware: Newark, *H. S. Jackson* (D).
District of Columbia: Washington, *J. S. Billings* (NY).
Virginia: *Mrs. Curtis* (H).
South Carolina: *Curtis n. 1199* (K); Columbia, *G. F. Atkinson* in herb.
Alabama: *Beaumont n. 4630* (C) (K); Auburn; *F. S. Earle* (NY); University, *J. Y. Graham* (D).
Michigan: "Sailor's Encampment", *Harper* (Wis).

4. **Mitrula cuculiata** (Batsch) Fries, Epicr. 584. 1836—1838. (Figure 1.)
Elvella cucullata Batsch, Elen. Fung. Cont. **1**: 189. *f. 132.* 1786.
Mitrula Heyderi Pers. Römer's N. Mag. für die Bot. **1**: 116. *pl. 3, f. 12.* 1794. Schum. Enum. Sael. **2**: 409. 1803.
Leotia Mitrula Pers. Syn. Meth. Fung. **1**: 611. 1801.
Heyderia cucullata (Batsch) Boud. Bull. Soc. Myc. Fr. **1**: 110. 1885.

Illustrations: Batsch l. c.; Pers. Römer l. c.; Cke. Mycog. *pl. 45, f. 175*; Gill. Disc. Fr. *pl. 28, f. 2*; Sowerb. Eng. Fung. *pl. 84*; Mass. Ann. Bot. **11**. *pl. 12, f. 39—41.*

Type: European, probably no longer in existence.

Plants small, solitary or gregarious, very slender, 1—2,5 cm high; ascigerous portion elliptical, ovate or obovate, rounded above, distinct from the stem below and free from it for a slight distance, scarcely compressed, 1—3 mm long, 0,5—2 mm thick, cream-color to yellowish ochraceous; stem terete, equal or tapering slightly upward, yellowish brown above, darker below, granular pruinose, the lower end frequently enveloped in and attached by a yellowish brown tomentum, 0,5—0,75 mm thick. All parts become slightly darker in drying. Asci clavate, apex narrowed, the pore blue with iodine, 45—70 × 6 μ; spores 8, obliquely uniseriate or biseriate, hyaline, continuous, smooth, narrowly fusiform, straight or

curved, 13—16 ⩽ 2—3 μ; paraphyses rather stout, gradually thickened upwards, septate, brownish, 3—4 μ thick.

On fallen leaves of conifers; August—September. North-eastern United States.

A minute species, well marked by its color, small size, slender habit, and the habitat on coniferous leaves. Through the kindness of Dr. Lotsy I have been able to see a fragment of Persoon's material of *Leotia Mitrula*, with which our American material agrees *(fig. 1)*. Batsch's description and figure are quite characteristic. Massee says that the spores are distinctly septate in a specimen named by Persoon, but I have not yet detected such a condition. Certain European specimens called *M. cucullata* are slightly larger than the American, but do not seem to differ otherwise. On the other hand I have Swedish and English gatherings which exactly match our own. The plants are so small as to be easily overlooked, so that the species is probably much more widely distributed in our coniferous forests than the records indicate.

Material examined:

European: Persoon's type of *Leotia Mitrula;* Roumg. Fung. Gal. *n. 2377;* Krieger, Fung. Saxon. *n. 922.* Also Swedish specimens in herb. Fries, and from Stockholm, *Romell;* British from Yorkshire ex herb. C. Crossland.

Maine: Kittery Point under *Abies, R. Thaxter* (B).

New Hamphshire: Lower Bartlett, on *Tsuga* leaves, *R. Thaxter* (T) (D).

New York: Forestburg, Sullivan Co., Rainbow, Franklin Co., North Elba, Essex Co. & Summit, Saratoga Co., on spruce leaves, *Dr. Peck* (A); Willsboro Point, Essex Co., *C. O. Smith* (CU) (D); Honeoye and Canandaigua, Ontario Co., *Durand* (D); Watkins, Excelsior and Havana Glens, Schuyler Co., *Dr. Ferguson and Durand* (D). The last 6 on Tsuga.

5. **Mitrula gracilis** Karst. Hedw. **22**: 17. 1883; Rev. Mon. 110. 1885. (Figures 3—4.)

Mitrula gracilis var. *flavipes* Pk. Rep. N. Y. S. Mus. **49**: 59. 1896.

Type: in herb. Botanical Museum, University of Helsingfors.

Plants solitary, slender, 1—1,5 cm high; ascigerous portion obovate-globose, rounded above, not or very slightly free from the stem below, about 1 mm diam., orange brown, even or nearly so; stem slender, flexuous, 0,5—0,75 mm thick, smooth, pale brownish yellow, nearly translucent. Asci clavate, apex rounded, pore blue with iodine, 65—80 ⩽ 6—8 μ; spores biseriate, hyaline, smooth, oblong-fusiform to fusiform, continuous or possibly becoming 1-septate, 10—14 ⩽ 2—3 μ; paraphyses filiform, 1,5—2 μ thick.

Attached to and evidently parasitic on *Paludella squarrosa,* in bogs; March (?)—September. Labrador (NY), Newfoundland (A) (D), *Rev. A. C. Waghorne.* Reported also from Greenland by Rostrup.

Mitrula gracilis is a species of arctic and subarctic regions. Through the kindness of Prof. Dr. Elfving, of the University of Helsingfors, the entire material of Karsten's type has been placed in my hands for examination. The few plants present are very plainly attached to the stems of some moss (Webera?) mixed with *Hylocomium splendens*. Karsten's description (Rev. Mon. 110) fits the specimens quite well except that the ascigerous portion is somewhat convoluted in some plants, the stem has a distinct yellowish tint and is somewhat translucent. The American specimens agree well with the type *(figs. 3—4)*. This species has been examined only in the dried state so that the color, size etc. of the fresh plants are unknown. *M. gracilis* agrees with *M. muscicola* and *M. Rehmii* in habitat and differs from them principally in the smaller size and more even hymenium.

6. **Mitrula muscicola** P. Henn. Ofvers. af K. Vet. Ak. Forh. **1885**: 71. *pl. 8, f. 6—8.* 1885. (Figure 2.)

Illustrations: P. Henn. l. c.; Mass. Ann. Bot. **11**, *pl. 13 f. 73.*

Type: Probably at Berlin, from Norway.

Plants „caespitose, erect; pileus yellowish to tan-colored, obtuse, slightly Morchella-like, with a tendency to be ribbed or rugose, glabrous, about 4 mm long; stipe lighter colored to whitish, glabrous, solid, about 10 mm long". Asci clavate, apex narrowed, pore blue with iodine, 65—75 ⩽ 6—8 μ; spores 8, biseriate, hyaline, continuous, smooth, narrowly oblong-elliptical, 10—13 ⩽ 2—3 μ. Paraphyses filiform, very slightly thickened upward, hyaline, 2 μ thick.

On moss stems *(Webera nutans)*, „in moist spruce and balsam woods at about 7000 feet elevation", Laggan, Alberta, Aug. 1903. *Miss D. Hone.*

Part of the above description is taken from Miss Hone's notes published in Postelsia **1906**: 239. They were presumably taken from fresh plants. Three plants from this collection preserved in alcohol are in my possession. In these the ascigerous portion is distinctly convoluted. I have tried in vain to see an authentic specimen of *M. muscicola*. The description given by Hennings indicates a much larger plant than the figure represents. *M. Rehmii*, of which I have specimens from Bresadola, matches our American material very closely, and is doubtfully distinct from *M. muscicola*. Both appear to differ from *M. gracilis* only in the larger size and more convoluted hymenium. Our knowledge of the relationship of these three species is meagre and all need thorough study in the fresh state.

2. **Microglossum** Gill. Disc. Fr. 25. 1879.
Helote Hazsl. M. T. Akad. ért. A. Termés. Kor. **11**: — (8). 1881.
Geoglossum subg. *Leptoglossum* Cke. Mycog. **1**: 250. 1879. in part.

Ascoma fleshy, erect, stipitate, clavate, ascigerous only in the upper portion, bright colored (usually yellow, brown or green); asci clavate-cylindrical, opening by a pore; spores 8, biseriate, hyaline, smooth, elliptical, fusiform or cylindrical, becoming 3-many-septate; paraphyses present.

Plants with the general form and habit of *Mitrula* or *Geoglossum*, but always light colored, never black, and the spores several septate at maturity. The typical species is *M. viride* (Pers.) Boud.

In view of the confusion existing in the nomenclature of this group the following survey of the subject is offered. In Feb., 1879, Cooke[1]) formed the subgenus *Leptoglossum* to receive the hyaline-spored species of *Geoglossum* of older authors. This subgenus he divided into two sections, the first with ascomata black, the second with ascomata light colored. In the same year Gillet (l. c.) founded the genus *Microglossum* for the old *Geoglossum viride* Pers. and *G. olivaceum* Pers. *Microglossum* Gill. is, therefore, equivalent to the second or light colored section of *Leptoglossum* Cke. In 1884, Saccardo[2]), evidently overlooking Gillet's name, published a genus *Microglossum* Sacc. for „Geoglossa atra hyalospora Cookei", the type being *M. Hookeri* (Cke.), described as having continuous spores. *Microglossum* Sacc. equals the first or dark colored section of *Leptoglossum* Cke. On the same page Saccardo raised *Leptoglossum* Cke. (subgenus) to generic rank, mentioning as the type *L. microsporum* (C. & P.), a black species with septate spores also belonging to Cooke's first section. In the Sylloge both genera were admitted with limits unchanged. Schroeter[3]) included *Microglossum* Gill., with continuous spores, and *Leptoglossum* Cke. with spores septate. As a matter of fact the spores of all the forms mentioned become 3 or more septate at maturity, so that this distinction falls. I regard Cooke's sections characterized, the one by light colored, the other by black ascomata, as of generic value. *Microglossum* Gill. is the earlist name for the bright group. Although it is antedated by *Microglossa* D. C. (1836) it must stand according to a rule of the Vienna code, which, it is to be hoped, will be adopted also for the lower plants. If the American rules be followed it would be replaced by *Helote* Hazsl. (1881) also based on the same type species. For the black group the name *Leptoglossum* Cke. first gained nomenclatorial standing for a discomycetous genus in 1884, being thus antedated by *Leptoglossum* Karsten (1879). It must, therefore, give place to *Corynetes* Hazsl. (1881) the type species being *C. microsporus* (C. & P.) Hazsl. = *C. atropurpureus* (Pers.) Durand of the present paper.

---

[1]) Mycographia **1**: 250. 1879.
[2]) Bot. Cent. **18**: 214. 1884.
[3]) Engler & Prantl, Nat. Pfl. **1**[1]: 163—164. 1894.

A. Paraphyses strongly curved or uncinate and slightly thickened at the tips.
  B. Spores of one kind in the ascus.
    C. Ascomata bright yellow . . . . . 1. M. rufum.
    C. Ascomata yellowish-clay or tawny . . . . . 2. M. fumosum.
  B. Spores of two kinds in the ascus, the larger 60—100 μ long, 14—16-septate; ascomata cinnamon-brown . . . . . 3. M. longisporum.
A. Paraphyses straight or flexuous; ascomata usually with a greenish tint.
  D. Stem smooth, fibrous . . . . . 4. M. olivaceum.
  D. Stem squamulose, scarcely fibrous . . . . . 5. M. viride.

1. **Microglossum rufum** (L. v. S.) Underw. Minn. Bot. Studies **1**: 496. 1896. (Figures 9—14, 207.)
Geoglossum rufum L. v. S. Trans. Am. Phil. Soc. **4**: 181. 1834.
Clavaria contorta L. v. S. l. c. 182, *n. 1050* (not Fr.).
Geoglossum luteum Pk. Rep. N. Y. State Mus. **24**: 94, *pl. 3, f. 20—24.* 1872.
Mitrula lutescens Berk. Hedw. **14**: 9. Ja. 1875; B. & C. Grev. **3**: 149. Jn. 1875.
Geoglossum pistillaris B. & Cke. Mycog. 206, *pl. 96, f. 348.* 1878.
Corynetes luteus (Pk.) Hazsl. l. c. 1881.
Mitrula rufa (L. v. S.) Sacc. Syll. **8**: 38. 1889.
Mitrula pistillaris (B. & Cke.) Sacc. l. c.
Leptoglossum luteum (Pk.) Sacc. Syll. **8**: 48. 1889.
Xanthoglossum luteum (Pk.) O. K. Rev. Gen. Pl. **2**: 875. 1891.
Leptoglossum lutescens (B. & C.) Rehm var. *mitruloides* Rehm, Ann. Myc. **2**: 32. 1904.

Illustrations: Peck l. c.; Cke. Mycog. *pl. 3, f. 12; pl. 45, f. 178; pl. 96, f. 346 & 348;* Mass. Ann. Bot. **11**, *pl. 12, f. 28—30.*

Type: in herb. Phil. Acad. Nat. Sci., from New Jersey.

Plants solitary, gregarious or subcespitose, clavate, 2—5 cm high, rather slender; ascigerous portion $^1/_3$—$^1/_2$ the total length, elliptical-obovate, elliptical or subcylindrical, obtuse, usually compressed or longitudinally furrowed, 0,5—2 cm long, 6—12 mm wide, sharply differentiated from the stem, usually clear vitelline or orange yellow, rarely of a duller shade; stem terete, yellow, paler than the ascigerous portion, usually prominently squamulose, 1,5—3 cm high, 2—3 mm thick; whole plant becoming dingy yellowish- or reddish-brown when dry. Asci clavate, apex narrowed, pore blue with iodine, 100—140 × 10—12 μ (majority 115—130); spores 8, biseriate, hyaline, smooth, cylindrical or slightly narrowed toward the obtuse ends, straight or curved, for a long time

continuous, then multiguttulate, finally 5—10-septate, 18—38 ⩽ 5—6 μ (25—35); paraphyses filiform, 2—3 μ thick below, the apices slightly thickened and strongly curved or uncinate.

On rotten wood and humus rarely on mossy banks, frequent; July-September. Ontario to Louisiana west to Minnesota.

A very pretty and well marked species easily known by the yellow color of every part, the squamose stem, cylindrical septate spores, and the curved slightly thickened paraphyses. I have seen the types of all the species mentioned above, preserved in the herbaria of the Philadelphia Academy of Natural Sciences, of the New York State Museum of Natural History, and of Kew, and agree with Massee that they represent a single species. (Cfr. *figs. 9—14.*) These various types were characterized by their authors as „rufous" or „luteus" or „rufescens" or „dull yellow" all of which may be true of the dried material from which all the species were described. The fresh plant is much brighter. The scaliness of the stem always evident enough in the growing plant often becomes very obscure in drying or even disappears altogether. Specimens in the herbarium of C. G. Lloyd determined by Dr. Rehm as *Leptoglossum lutescens* (B. & C.) Rehm var. *mitruloides* Rehm differ in no respect from the ordinary form.

The measurements of the spores given in Cooke's Mycographia (*G. luteum* 50 ⩽ 10 μ, *G. rufum* 40—50 ⩽ 5 μ), and copied by Saccardo and others, are entirely erroneous as the specimens do not justify such figures.

Material examined:

Ontario: London, *J. Dearness* (D); Guelph, *J. H. Faull* (D).

Maine: Bar Harbor, *Miss V. White* (NY); Orono, *F. L. Harvey* (NY).

New Hampshire: Shelburne, *W. G. Farlow* (Mo); Lower Bartlett, *R. Thaxter* (T).

Vermont: *Frost* (Fr); Lake Dunmore, *E. A. Burt* (B); *W. G. Farlow* (B)

Massachusetts: Herb. Schweinitz (as *Clavaria contorta*); Naushon Island, *G. T. Moore* (B).

Connecticut: *C. C. Hanmer* in herb; West Haven, *R. Thaxter* (T).

New York: Sandlake, *C. H. Peck*, type of *G. luteum* (A); Adirondack Mts., East Worcester, Gansevoort & Floodwood, *Peck* (A); Lake Piseco, *G. F. Atkinson* (CU); New York City, *F. S. Earle* (NY); Knoxboro, *H. S. Jackson* (D); Kirkville, Und. & Cook, Ill. Fung. *n. 82* (CU); Ithaca, many collections (CU) (D); Farmington, *E. Brown* (NY); Buffalo, *G. W. Clinton* (US).

New Jersey: Hope, *Dr. Kampman*, type (S); Newfield, *J. B. Ellis*, N. A. Fungi *n. 58* (CU).

Pennsylvania: West Chester, *B. M. Everhart* (NY).

North Carolina: Blowing Rock, *Durand* (CU); *G. F. Atkinson* in herb.

South Carolina: Santee Canal, *H. W. Ravenel*, type of *Mitrula lutescens* (K).

Louisiana: *Hale n. 4825*, type of *G. pistillaris* (K).
West Virginia: Eglon, *C. G. Lloyd* (L).
Kentucky: Norwood, *A. P. Morgan* in herb.
Tennessee: Burbank, *R. Thaxter* (T).
Michigan: Bay View, *C. H. Kauffman* (D); Glen Lake, *C. G. Lloyd* (L) called *L. lutescens* var. *nitruloides* by Rehm.
Wisconsin: (CU *n. 15340*).
Minnesota: St. Louis River, *Arthur & Holway* (NY) (M).

2. **Microglossum fumosum** (Peck) Durand (Figures 15, 16, 203—205).
Leptoglossum luteum var. *fumosum* Pk. Rep. N. Y. S. Mus. **43**: 40. 1889.
Leptoglossum fumosum Pk. Bull. N. Y. S. Mus. **116**: 25. 1907.

Type: in herb. N. Y. S. Mus. Nat. Hist., from New York.

Plants solitary or more often densely cespitose, clavate, 2—6 cm high, robust; ascigerous portion obovate, elliptical or oblong, rounded above, more or less compressed and longitudinally furrowed, about $^1/_3$—$^1/_2$ the total length of the plant, but little distinct from the stem, smoky-yellowish-clay-color or tawny, 0,75—3 cm long, 3—12 mm thick, rarely twisted or contorted, more or less puckered below where it joins the stem; stem terete or slightly compressed, 1—3 cm long, 3—5 mm thick, clay-colored, slightly squamulose or sometimes smooth and shining, with several longitudinal cavities, rather fibrous. Asci clavate, the apex narrowed, pore blue with iodine, 100—150 × 10—12 μ; spores 8, biseriate, hyaline, smooth, cylindrical or slightly narrowed toward the obtuse ends, usually slightly curved, 20—50 × 5 μ (35—43), at first continuous, finally 7—15-septate; paraphyses filiform, septate, 2 μ thick, slightly thickened and strongly curved above.

On much decayed rotten logs and about the bases of stumps; July—August. Massachusetts and New York.

This species is allied to *M. rufum* from which it differs in the clay-buff color, more robust chunked habit, smoother stem, and the longer spores with more septa. I have seen several instances in which the stem was forked, and young ascomata commonly arise from the base of the stems of older ones. I have had abundant opportunity to compare this form with *M. rufum* in the field, and find that the two species differ constantly in the characters noted. Dr. Peck himself is now convinced that the present is a distinct species. In drying the stem becomes dark mummy-brown, shining, and the ascigerous portion brownish ochraceous.

Material examined:

Massachusetts: Stow, June 26, 1907, *S. Davis* (A).
New York: Adirondack Mts., Aug., *C. H. Peck* (A type); Sandlake, Aug. 7, 1906, *C. H. Peck* (A); Ithaca, numerous collections from several stations, in five different years (CU) (D).

3. **Microglossum longisporum** Durand sp. nov. (Figures 17, 18, 206, 206a.)

Ascomata gregaria, clavata, multiformia, 3—6 cm alta; clavula oblonga vel elliptica, obtusa, compressa, saepe sulcata, cinnamomeo-umbrina, 1—2,5 cm longa, 4—10 mm lata; stipes teres, squamulosus, saepe denique glaber nitens, cinnamomeus, aequalis, 2—4 cm longus, 2—4 mm latus. Asci cylindraceo-clavati, apice rotundati, poro iode caerulescente, 100—140 ⩻ 12—15 μ; sporidia 8, biformia: duo longa, parallele posita, levia, cylindracea, demum 14—16-septata, 60—100 ⩻ 4—5 μ; sex brevia, similia, continua, ad apicem asci irregulariter posita, 12—18 ⩻ 3 μ; paraphyses filiformes, 2 μ crassae, hyalinae, sursum leniter incrassatae, fortiter curvatae.

Plants solitary, gregarious, clavate, often curved or contorted, rich cinnamon-brown, 3—6 cm high; ascigerous portion occupying about $^1/_3$—$^1/_2$ the total length, slightly differentiated from the stem, oblong to elliptical, obtuse, more or less compressed and longitudinally furrowed, slightly darker than the stem, often with an umber tint, 1—2,5 cm long, 4—10 mm wide, flesh yellowish brown; stem terete, squamulose, sometimes later becoming nearly smooth and hygrophanous, clammy or slightly viscid below, 2—4 cm long, 2—4 mm thick, equal. Asci cylindrical-clavate, apex rounded, only slightly narrowed, the pore blue with iodine, 100—140 ⩻ 12—15 μ; spores 8, of two kinds in the ascus: the first 2 in number (very rarely 3 or 4), lying side by side and nearly as long as the ascus, hyaline, smooth, cylindrical or a very little broader in the middle, ends rounded, straight or curved, at first continuous and multiguttulate finally becoming about 14—16-septate, 60—100 ⩻ 4—5 μ; the second 6 (rarely less) usually placed irregularly near the apex of the ascus, similar to the first kind but smaller, 12—18 ⩻ 3 μ, rarely longer, usually continuous; paraphyses filiform, 2 μ thick, hyaline, the apices slightly thickened and strongly curved or uncinate.

On the ground among leaves in the midst of grasses and carices, in rich woods and ravines; August. New York, North Carolina and Michigan.

A beautiful and distinct species characterized by the cinnamon-brown color, dimorphic spores, the large size of the larger spores, and the curved paraphyses.

Material examined:

New York: Ithaca, 6-mile Cr., Aug. 14, 1902, *Long & Durand* (CU *n. 13524* type), McGowan's woods, Aug. 20, 1902, *W. H. Long*.

North Carolina: Blowing Rock, Aug., 1889, *G. F. Atkinson* in herb. *n. 779*.

Michigan: Glen Lake, Aug., 1902, *C. G. Lloyd* (L).

4. **Microglossum olivaceum** (Pers.) Gill. Disc. Fr. 25. 1879. (Figures 19—22, 209.)

Geoglossum olivaceum Pers. Obs. Mycog. **1**: 40, *pl. 5, f. 7*. 1796.

G. (Leptoglossum) olivaceum (Pers.) Cke. Mycog. 250. 1879.
Mitrula olivacea (Pers.) Sacc. Syll. Fung. **8**: 38. 1889.
Microglossum contortum Pk. Bull. Torr. Bot. Club **25**: 328. 1898.
Microglossum obscurum Pk. l. c. **26**: 71. 1899.

Illustrations: Pers. l. c.; Cke. Mycog., *pl. 4, f. 13*; Pat. Tab. Anal. *f. 65*; Berk. Outl., *pl. 22, f. 3.*

Type: European, no longer in existence.

Plants solitary or clustered, clavate, either regular or twisted or contorted, 2—8 cm high; ascigerous portion occupying about $^1/_3$—$^1/_2$ the total length, continuous with the stem but sharply delimited by color, greenish-brown often with a yellow or buff tint, compressed, obtuse, up to 3 cm long, 10 mm wide; stem terete or compressed above, perfectly smooth, shining, hygrophanous, yellowish-buff, tawny-buff, smoky-olive-buff or brownish-cervinus, fibrous, solid, 2—8 mm thick. Asci cylindrical-clavate, apex rounded, rarely narrowed, pore blue with iodine, 75—100 × 9–10 μ; spores 8, biseriate above, uniseriate below, hyaline, smooth, oblong-fusiform to fusiform, straight, curved or sigmoid, for a long time continuous, finally becoming 3-septate, 12—18 × 4—6 μ; paraphyses filiform, often branched, septate, straight or slightly curved or flexuous, not thickened above, hyaline.

On the ground among leaves or in grassy places in rich woods: May—September. North-eastern United States and Ontario.

A distinct species, quite variable in size and form, but well marked by the greenish buff or smoky tint of the fresh plant, the smooth fibrous stem, and the fusoid, ultimately 3-septate spores. The septa are often obscure but may usually be made more evident by iodine. Dried plants become more distinctly brown. I have seen the types as well as other specimens from the original collections of both *M. obscurum* and *M. contortum* Pk. While these differ somewhat in form I cannot distinguish them otherwise from the other gatherings or from European material. (Figs. 19—22.) The type of *Geoglossum olivaceum* seems to be missing from Persoon's herbarium. His descriptions, however, indicate a plant allied to *G. viride*, having an olivaceous tint and smooth stem. The American material conforms to this interpretation, and agrees fully with specimens named by Fries, Cooke and Phillips.

Material examined:

European: Phill. Elv. Brit. *n. 5*; Cke. Fung. Brit. *n. 650*; Kunze, Fung. Sel. *n. 195*. Also Swedish specimens in herb. Elias Fries labled in his own handwriting.

Ontario: London, *J. Dearness* (A), type of *M. obscurum* Pk. (D).

New Hampshire: Delaware, *R. Thaxter* (T).

Vermont: Grandview Mt., *E. A. Burt* (D).

Connecticut: New Haven, *R. Thaxter* (T).

New York: Ithaca, *W. H. Long* (CU), E. & E. Fung. Col. *n. 1745*, also many other stations and collectors (CU) (D).

District of Columbia: Rock Creek Park, *Mrs. E. M. Williams* (A), type of *M. contortum* Pk., also (D) (L).

Ohio: College Hill, *C. G. Lloyd n. 2715* (L).

5. **Microglossum viride** (Pers.) Gill. Disc. Fr. 25. 1879. (Figures 23—26, 208.)

? *Clavaria serpentina* O. F. Mueller, Zool. Dan. Prod. 256. 1776.

? *Clavaria mitrata* β *viridis* Holmsk. Coryph. 24. *fig.* 1790.

? *Clavaria viridis* Schrad. Gmel. Linn. Syst. Nat. **2**: 1443. 1791.

Geoglossum viride Pers. Römer's N. Mag. für die Bot. **1**: 117. 1794; Obs. Myc. **1**: 39. 1796.

Mitrula viridis (Pers.) Karst. Myc. Fenn. **1**: 29. 1871.

Helote viridis (Pers.) Hazsl. l. c. 1881.

Leptoglossum alabamense Underw. Bull. Torr. Bot. Club **24**: 82. 1897.

Illustrations: Cke. Mycog., *pl. 4, f. 14*; Gill. Disc. Fr., *pl. 26, f. 2*; Mass. Ann. Bot. **11**, *pl. 13, f. 68*; Rehm, Disc. 1144, *f. 1—4*; Phill. Brit. Disc., *pl. 2, f. 8*.

Type: European, in herb. Persoon at Leiden.

Plants solitary, or more often gregarious or cespitose, clavate, up to 5 cm high; ascigerous portion about $^1/_2$ the total length, sharply delimited from the stem, lanceolate to elliptical, obtuse, strongly compressed and deeply longitudinally furrowed in older specimens, 3—10 mm wide, olive-buff or olive-ochraceous; stem terete, or slightly compressed, 2—5 mm thick, conspicuously squamulose, pale pea-green; dried plants are darker sometimes almost black; crushed flesh pea-green to olive, usually pale. Asci clavate-cylindrical, apex rounded or slightly narrowed, pore blue with iodine, slender below, 110—150 × 8—10 μ; spores 8, biseriate above, uniseriate below, hyaline, smooth, cylindrical-oblong, elliptical-oblong or oblong-clavate, ends obtuse, straight or curved or sigmoid, for a long time continuous, finally becoming clearly 3—4-septate, 14—22 × 5—6 μ; paraphyses filiform, branched, hyaline, the apices often slightly piriform-thickened and tinged green, forming a green epithecium.

On the ground, in moist woods, often along the borders of old wood roads; June-October. Eastern United States.

A fine species easily recognized at sight by the pea-green color and the squamose stem. It is not common, but is probably much more widely distributed than the localities mentioned would indicate. It is similar in color to *Leotia chlorocephala* by which it is often accompanied. The type of *Leptoglossum alabamense* Underw., kindly loaned me for examination by Prof. Wilcox, of the Alabama Polytechnic Institute, proves to be this

species. The specimens are old and blackened but still retain a distinct greenish tint. *(Fig. 24.)*

What is probably this species was early noticed and named by Mueller and Schrader. Their descriptions are, however, too brief to indicate more than an element of probability. Holmskjöld described and figured it in his privately distributed work of 1790, the description alone being reprinted in 1795 in Usteri's Annalen. Persoon first used the name *Geoglossum viride* without description in 1794, but in 1796 gave an unmistakeable diagnosis. His specimens are preserved at Leiden, and a fragment was given me by Dr. Lotsy for examination. The microscopic structure corresponds fully to that of the European and American material examined. I adopt Persoon's name, therefore, as being the earliest one about which we have definite knowledge. *(Fig. 23.)*

Material examined:

European: Persoon's type, at Leiden; Moug. & Nest. Stirp. Crypt. *n. 994* (CU); Phill. Elv. Brit. *n. 54* (D); Roumg. Fung. Gal. *n. 2378* (CU); Lib. Pl. Crypt. Ard. *n. 123* (US). Also Swedish specimens in herb. Elias Fries labled in his own hand; British, col. *G. F. Atkinson*, in Yorks.

New Hampshire: Delaware and Intervale, *R. Thaxter* (T); Flume. *E. Faxon* (H).

Connecticut: West Haven, *R. Thaxter* (T).

New York: Ithaca, various stations and collectors (CU) (D), E. & E. Fung. Col. *n. 1746*.

New Jersey: Closter, *C. F. Austin* (Neb) (C).

Pennsylvania: West Chester, *B. M. Everhart* (NY), E. & E. N. A. F. *n. 2030* (CU).

Delaware: Newport, *A. Commons* (NY).

North Carolina: Blowing Rock, *Durana* (CU).

Alabama: Auburn, "herb. A. P. I." type of *Leptoglossum alabamense* Und.

3. Corynetes Hazsl. M. T. Akad. ért. A. Termés Kor. **11**: — (8). 1881.
Geoglossum subg. *Leptoglossum* Cke. Mycog. 250. 1879, in part.
Microglossum Sacc. Bot. Cent. **18**: 214. 1884 (not Gill.).
Leptoglossum (Cke.) Sacc. l. c. (not Karsten 1879).
Thuemenidium O. K. Rev. Gen. Pl. **2**: 873. 1891.
Xanthoglossum (Sacc.) O. K. l. c. 875. 1891.

Ascoma fleshy, erect, stipitate, clavate, the hymenium covering only the upper portion, black, brownish black or purplish black; asci clavate-cylindrical, opening by a pore; spores 8, usually biseriate, hyaline, smooth, cylindrical, ends rounded, 3-many-septate; paraphyses present.

Plants with the habit and aspect of *Geoglossum*, but differing from that genus in the hyaline spores, and from *Microglossum* in the black color of the ascomata. The type species is *C. microsporus* (C. & P.) Hazsl.

= *C. atropurpureus* (Pers.) Durand. For a discussion of the nomenclature of the genus see under *Microglossum*.

A. Paraphyses hyaline or only slightly purplish tinted at the tips.
  B. Asci and paraphyses agglutinated at the tips into a conspicuous vinous-brown epithecium.
    C. Paraphyses clavate to piriform thickened at the tips . . . . . 1. C. purpurascens.
    C. Paraphyses not or only very slightly thickened at the tips . . . . . 2. C. atropurpureus.
  B. Epithecium lacking or inconspicuous; plants robust; paraphyses slightly clavate-thickened and more or less curved at the tips . . . . 3. C. robustus.
A. Paraphyses conspicuously brown . . . . . 4. C. arenarius.

1. **Corynetes purpurascens** (Pers.) Durand. (Figures 36—39.)
? *Clavaria mitrata* Holmsk. Coryph. 21, with *fig.* 1790.
Geoglossum purpurascens Pers. Comm. Fung. Clav. 39. 1797.
Leotia atropurpurea Corda, Icon. Fung. **5**: 79, *pl. 9, f. 71.* 1842.
Geoglossum atropurpureum Cke. Mycog. 10, *pl. 4, f. 16.* 1875 (not Pers.).
Microglossum atropurpureum Sacc. Syll. **8**: 40. 1889; Rehm Disc. 1152.
Thuemenidium atropurpureum O. K. Rev. Gen. Pl. **2**: 873. 1891.
Mitrula purpurascens (Pers.) Mass. Ann. Bot. **11**: 266, *pl. 12, f. 27.* 1897.

Illustrations: Corda l. c.; Cooke l. c.

Type: European, no longer in existence.

Plants solitary or cespitose, 3—6 cm high, every part with a distinct purplish-brown tint when fresh, blackish when dry, the crushed flesh vinous-brown; ascigerous portion irregular, clavate, sometimes lobed or forked at the apex, more or less compressed, 1—2 cm long, up to 1 cm broad, occupying about $^1/_3$—$^1/_2$ the total length; stem cylindrical, minutely squamulose. Asci clavate, apex narrowed but rounded, pore blue with iodine, 105—120 × 10—12 μ; spores 8, biseriate, hyaline, smooth, cylindrical, slightly narrowed from the middle to the rounded ends, straight or curved, at first continuous, then multiguttulate finally 6-septate, 20—37 × 5—6 μ (20—30); paraphyses filiform, hyaline, 3 μ thick, the apices straight and abruptly obovate-piriform thickened, 8—10 μ thick, agglutinated with amorphous matter to form a vinous-brown epithecium.

On the ground or humus; August—October. Maine and New York.

This species has usually been united with the following, but examination of authentic specimens of both species shows that the present differs in the more distinctly purplish tint of the fresh plant, and especially in the more abruptly thickened tips of the paraphyses.

The type of the species is not present in the herbarium of Persoon. There is, however, in the Kew Herbarium a specimen named *Geoglossum purpurascens* by Persoon, which must, in the absence of the type, be regarded as the most authentic example of the species in existence. Through the courtesy of the authorities at Kew I have been permitted to make a microscopical examination of this specimen. The paraphyses are distinctly, usually abruptly thickened at the apices, a condition well indicated in the descriptions and figures given by Massee, Rehm, Cooke and Corda. *(Fig. 39.)* The vinous-brown epithecium is conspicuous when a bit of the hymenium is crushed on a slide. I have seen only two American gatherings, both of them in the dried state. The Maine specimens were said by Dr. Thaxter to be of a dull purplish-brown color when fresh.

Material examined:

European: Specimen named by Persoon, at Kew; Specimen from near Stockholm, ex herb. L. Romell (D), det. E. J. D.

Maine: Kittery Point, in poor rocky pastures, Oct. 15, 1887, *R. Thaxter* (T) (B) (D).

New York: Knoxboro, Oneida Co., on humus in swamp, Aug. 20, 1904, *H. S. Jackson* in herb. (D).

2. **Corynetes atropurpureus** (Pers.) Durand (Figures 27—35).
Geoglossum atropurpureum Pers. Obs. Myc. **2**: 62, *pl. 3, f. 5.* 1799.
Mitrula glabra Karst. Myc. Fenn. **1**: 30. 1871.
Geoglossum microsporum C. & P. Rep. N. Y. S. Mus. **25**: 97. 1873.
Geoglossum microsporum var. *tremellosum* Cke. Grev. **4**: 109. 1876.
Geoglossum tremellosum Cke. Mycog. 206, *pl. 96, f. 347.* 1878.
Corynetes microsporus (C. & P.) Hazsl. l. c. 1881.
Leptoglossum microsporum (C. & P.) Sacc. Bot. Cent. **18**: 214. 1884.
Microglossum atropurpureum Karst. Rev. Mon. 110. 1885.
Xanthoglossum microsporum (C. & P.) O. K. Rev. Gen. Pl. **2**: 875. 1891.
Mitrula microspora (C. & P.) Mass. Brit. Fung.-Fl. **4**: 483. 1895.

Illustrations: Pers. l. c.; Cke. Mycog. *pl. 3, f. 11*; *pl. 96, f. 347*; Mass. Ann. Bot. **11**, *pl. 13, f. 55—57.*

Type: in herb. Persoon, at Leiden.

Plants solitary or cespitose, entirely black, at least when dry, rather slender, 2—3 cm high; ascigerous portion about $^1/_2$ the total length, narrowly clavate-oblong, obtuse; stem slender, minutely squamulose. Asci clavate, apex narrowed but rounded, 100—127 $\lessgtr$ 10 μ; spores 8, biseriate, hyaline, smooth, cylindrical but tapering slightly toward the obtuse ends, at first continuous, finally becoming up to 10-septate, 25—35 $\lessgtr$ 3—4 μ; paraphyses filiform, hyaline, branched, straight, the apices

scarcely thickened and rarely only slightly bent, the tips of the asci and paraphyses being united by a vinous-brown amorphous layer forming an epithecium.

On the ground in woods; September. New Hampshire and New York.

I have examined a fragment of the type of this species, which is preserved in Persoon's herbarium at Leiden *(fig. 27)*, as well as the type of *G. microsporum* C. & P., at Kew. Portions of the original collection of the latter at Albany and New York have also been studied. *(Figs. 30 and 35.)* They are identical in every respect so far as one can judge from dried material. Definite information regarding the color of the fresh plants is lacking on both cases, although Persoon described it as „atro-purpureus". *Clavaria mitrata* Holmsk. would probably be referred to this or the preceding species, but its exact position cannot be determined at the present day in the absence of specimens. This species is closely allied to *C. robustus* and *C. purpurascens*. From both it differs in its straight, hyaline paraphyses, which are scarcely thickened above and united into a conspicuous purplish brown epithecium. It differs from the former also in the smaller spores.

So far as I have been able to discover this species has been collected only three times in America. In Europe it seems to be more widely distributed since I have seen specimens from Britain, Sweden and Finland. *Geoglossum tremellosum* Cke., of which I have examined a portion of the type from Scotland *(fig. 34)*, agrees well with Persoon's material of this species. Two of the plants in my copy of Phillips's Elv. Brit. *n. 55* (called *Geoglossum glabrum* Pers.) belong here *(fig. 32)*, as does the specimen collected by Mr. C. Bucknall at Clifton, which I saw in the herbarium of Mr. Phillips, at Shrewsbury. *(Fig. 31.)* The spores of the latter specimen measure 18—25 ⩽ 4—5 μ (not „50 ⩽ 10") and have fewer septa, but the plants agree otherwise. While I have seen no authentic material of *G. Hookeri* Cke., I have no doubt that it also belongs here. There are also two specimens in the herbarium of Elias Fries. One, called *G. difforme* Fr., collected near Upsala, Sweden, Sept. 2, 1866 *(fig. 33)*, the other called *G. atropurpureum*, collected at Mustiala, Finland, Sept. 22, 1866, by Karsten *(Fig. 28)*. The latter is probably part of the material referred to in Karsten's Rev. Mon. (l. c.). In his Symbolae **4**: 186 Karsten says the ascomata of Finnish specimens are nearly black.

Cooke gave the measurements of the spores of *G. microsporum* as „50 ⩽ 10". Massee has examined every specimen sent to Cooke by Peck, but finds nothing agreeing with these figures, nor do I find them thus in the specimens examined. Saccardo (Syll. 47) refers the *G. microsporum* of Peck's 25th Report to *Leptoglossum tremellosum*, and that of Cooke's Mycographia, with alleged broad spores to *L. microsporum*. Such a broad-spored form probably does not exist. (cfr. *Mitrula macrospora* Mass. Brit. Fung.-Fl. **4**: 484).

Material examined:

European: Type in herb. Persoon, at Leiden; Scotland, *White;* England, *Phillips, Bucknall;* Sweden, *T. M. Fries;* Finland, *Karsten.*

New Hampshire: Wood road in high woods above Lower Bartlett, Sept., 1901, *R. Thaxter* (T) (D).

New York: Burnt ground under *Pteris aquilina,* Greig, Sept. *C. H. Peck* (K) type of *G. microsporum,* (A) (NY); Catskill Mts., *Peck* (A).

3. **Corynetes robustus** Durand sp. nov. (Figures 40—44, 198—202.)

Ascomata gregaria vel caespitosa, atra, robusta, 2,5—8 cm alta; clavula brunneo-olivacea tincta, obtusa, 1—3 cm longa, 6—15 mm lata, compressa vel sulcata; stipes teres, brunneo-ater, glaber, nitens, sursum leviter squamulosus, 1—4 cm longus, 3—8 mm latus. Asci clavati, crassi, subsessiles, apice contracti, poro iodo caerulescente, 100—150 ⩽ 10—12 μ (plurimi 120—135 μ); sporidia 8, sursum disticha, hyalina, levia, cylindracea, multiguttulata demum 7—11-septata, 25—50 ⩽ 4—6 μ (30—40 μ); paraphyses hyalinae, filiformes, 2—3 μ crassae, apice leniter incrassatae et curvatae, non vel leniter sursum cohaerentes.

Plants solitary or gregarious often cespitose, black or brownish black, 2,5—8 cm high, stout; ascigerous portion occupying about $^1/_4$—$^1/_2$ the total length, not sharply differentiated from the stem, black with an olive-brown tint, piriform-elliptical, obtuse, 1—3 cm long, 6—15 mm broad, more or less compressed or longitudinally furrowed, sometimes twisted, hollow, flesh dark brown; stem terete or compressed, paler, shining brownish black, hygrophanous, lightly squamulose above, 1—4 cm high, 3—8 mm thick. Asci clavate, stout, sessile or short stipitate, apex narrowed, pore blue with iodine, 100—150 ⩽ 10—15 μ (120—135); spores 8, biseriate above, uniseriate below, hyaline, smooth, cylindrical, slightly narrowed toward each end, at first continuous, multiguttulate, finally 7—11-septate, straight or curved, 25—50 ⩽ 4—6 μ (30—40); paraphyses hyaline, filiform, branched, 2—3 μ thick, the apex slightly irregularly thickened, usually curved or uncinate at the tips which are not or only slightly agglutinated into an epithecium.

On rich sandy humus among leaves in damp woods; August—September. Maine to Mississippi.

Closely related to the preceding but differs in the more robust, chunked, cespitose habit, larger spores, and absence of the conspicuous vinaceous-brown epithecium so noticeable in that species. The paraphyses are also more inclined to be thickened and more strongly curved above. I have seen spores 78 μ long but these are unusual.

Material examined:

Maine: Kines, Oct., 1907, *C. C. Hanmer* (A).

Massachusetts: South Bilerica, Sept. 8, 1901, *Mr. Rorer* (H) (T) (D); Sherburn, *G. E. Morris* (A) (D).

New York: Ithaca, Aug. 19, 1902, *J. M. Van Hook* (CU) (D).
North Carolina: Blowing Rock, Sept. 6, 1901, *Durand* (CU type) (D).
Mississippi: Ocean Springs, *Tracy & Earle*, Feb. 19, 1898 (NY).

4. **Corynetes arenarius** (Rostrup) Durand (Figures 45—49, 194—197).
Microglossum arenarium Rostr. Med. om. Grønland **3**: 606. 1891; Bot. Tidssk. **18**: 76. 1892; Bot. Cent. Beiheft. **1893**: 3.
Leptoglossum latum Pk. Bull. Torr. Bot. Club **22**: 210. 1895.
Mitrula arenaria (Rostr.) Mass. Ann. Bot. **11**: 283. 1897.

Type: in Copenhagen, from Greenland.

Plants single or cespitose, broadly clavate, black, 1—4 cm high; ascigerous portion about $^1/_2$ the total length, 0,5—2 cm broad, irregularly bent or contorted, compressed, furrowed, black; stem brownish black or olive-black, pruinose or squamulose. Asci stout, clavate-cylindrical, apex narrowed, pore blue with iodine, 100—125 × 12—15 μ; spores 8, biseriate above, uniseriate below, hyaline, smooth, cylindrical or cylindric-oblong, ends rounded, straight or curved, 25—35 × 6 μ, for a long time continuous, finally becoming at least 4-septate (probably 10 or more); paraphyses brown, cylindrical, septate, longer than the asci, 3 μ thick below, the apices usually somewhat clavate-thickened and more or less curved.

In sand; September. Greenland, Labrador and Newfoundland.

A well marked northern species easily told from the other American members of the genus by the long, conspicuous, brown paraphyses. Through the kindness of the late Dr. E. Rostrup, of Copenhagen, I have been able to see specimens collected in East Greenland *(figs. 48* and *194)* and in Denmark *(figs. 49* and *195)*. I have also examined examples of *L. latum* Pk., collected in Labrador and Newfoundland and named by Dr. Peck. *(Figs. 45—47, 196—197.)* All the specimens agree perfectly and represent a single species. The stems in the dried material are brownish rather than olive as described, but any greenish tint they may have had when fresh would probably disappear in drying. Both Rostrup and Peck describe the spores as continuous, but some of them certainly become septate as described above.

Material examined:

European: Jutland, Denmark, Aug., 1890, *E. Rostrup* (D).

Greenland: East Greenland, Aug., 1890, *N. Klartz*, ex herb. Rostrup (D), type.

Labrador: "L'Anse au Mort, The Straits", Sept., 1894, *Rev. A. C. Waghorne* (A) type of *L. latum* Pk. also (NY) (Mo).

Newfoundland: Sept. 18., 1899, *A. C. Waghorne n. 22* (NY).

Corynetes globosus (Sommf.) Durand (*Mitrula globosa* Sommf. Sup. Fl. Lap. 287, *f. 3*) has not been collected since its original discovery in Lapland many years ago. Two plants labled "Norge, Sommerfelt" are

preserved in the herbarium of Elias Fries. Microscopical examination shows the species to belong in *Corynetes*, and to be very closely related to *C. arenarius*, differing principally in the paler color and subglobose head. The dried plants are blackish. The spores are nearly cylindrical, multiseptate, 25—30 × 5—6 μ. The paraphyses are brown and longer than the asci. I suspect that when this species is rediscovered an examination of fresh material will show it to be the same as *C. arenarius*.

4. Gloeoglossum Durand nomen nov.

Geoglossum of authors in part.

Ascomata viscida, clavata, stipitata, sursum ascigerentia, atra vel brunneo-atra; asci cylindraceo-clavati, poro dehiscentes; sporidia 8, parallele posita vel multiseriata, cylindraceo-clavata, 3—15-septata, fuliginea; paraphyses septatae, sursum incrassatae vel circinatae, brunneae, non solum clavulam sed etiam stipitem usque ad basim tegentes.

Ascoma viscid-gelatinous, erect, stipitate, clavate, usually ascigerous only in the upper portion, black or brownish black; asci clavate-cylindrical, opening by a pore which becomes blue with iodine; spores 8, fascicled or multiseriate in the ascus, cylindrical or clavate-cylindrical, 3—15-septate (rarely continuous in one species), brown or fuliginous; paraphyses numerous, septate, thickened or coiled and brown above, not confined to the hymenium but continued down the stem to its base.

Plants with the general aspect of *Corynetes* and *Geoglossum* but of a viscid-gelatinous consistency when fresh, and further characterized by the fact that the paraphyses are not confined to the hymenium but continue with unchanged form down the stem to its base, thus forming a thick gelatinous ectal layer or coating over it. The species of this genus preserve in the adult state a condition somewhat like that in very young ascomata of species of *Geoglossum* and *Trichoglossum*. In these the ascoma is at first completely covered with hairs which project outward at right angles to the surface. As it increases in size the asci are developed between these hairs in the upper or ascigerous portion where they then become the paraphyses. On the lower or stem portion the expanding tissue beneath soon causes them to become isolated or grouped in separate patches so that the surface appears squamulose. In *Gloeoglossum*, however, the mature ascoma is completely covered with a thick coating of densely crowded hairs, the form of the latter being characteristic of the species. This layer is especially conspicuous in cross section (*figs 150* and *160*), which presents a strikingly different appearance from that of *Geoglossum*. (*Fig. 161.*) A longitudinal section of the ascoma shows that the asci, abundant above, gradually cease as one passes downward, while the paraphyses continue in the same abundance, and with the same peculiar form as those in the hymenium.

In *Gl. difforme* scattered asci may be found among them even to the base of the stem. *(Fig. 162.)*

The typical species is *Gl. difforme* (Fr.) Durand (*G. Peckianum* Cke.).

A. Spores 0—7-septate when mature
  B. Spores 0—7-septate, clavate-cylindrical, 55—102 μ long . . . . . 1. Gl. glutinosum.
  B. Spores 7-septate, clavate, 43—65 μ long . . . . 2. Gl. affine.
A. Spores 15-septate when mature . . . . . 3. Gl. difforme.

1. **Gloeoglossum glutinosum** (Pers.) Durand (Figures 70—72, 149—155).
Geoglossum glutinosum Pers. Obs. Myc. **1**: 11. 1796.
? Geoglossum viscosum Pers. Com. Fung. Clav. 39. 1797.
Geoglossum glutinosum β *lubricum* Pers. Myc. Eur. **1**: 197. 1822.

Illustrations: Cke. Mycog. *pl. 2, f. 6*; *pl. 3, f. 10*; Gill. Disc. Fr. *pl. 25, f. 2*; *pl. 26, f. 1*; Grev. Scot. Crypt. Fl. *pl. 55*; Mass. Ann. Bot. **11**. *pl. 13, f. 66, 67.*

Type: European, in herb. Persoon, at Leiden.

Plants solitary or clustered, 5—8 cm hight, viscid-gelatinous; ascigerous portion clavate or narrowly elliptical, more or less compressed, apex obtuse, 1,5—2,5 cm long, 5—10 mm thick, black, not sharply differentiated from the stem; stem 4—6 cm long, 3—4 mm thick, terete or slightly compressed, brown or brownish black, very smooth and viscid, covered to the base by the paraphyses; flesh brown, composed of parallel septate hyphae, rather looser in the center. Asci narrowly clavate, narrowed from the middle toward the apex, the pore blue with iodine, up to 250 × 12—15 μ; spores 8, multiseriate in the ascus, cylindrical, or slightly narrowed toward the rounded ends, fuliginous, at first continuous, then 3-septate, finally in most cases 7-septate, 55—102 × 5—6 μ (75—85); paraphyses cylindrical, septate, 3 μ thick, longer than the asci, the apices pale brown and abruptly piriform to globose thickened, 8—10 μ thick.

On the ground and on rotten wood, in rich woods; July—September. Ontario to North Carolina.

A very neat species known by the terete, viscid, brown stem and rather elliptical, darker ascigerous portion, together with the 0—7-septate, nearly cylindrical spores, and the long paraphyses with piriform to globose tips. Through the kindness of Dr. Lotsy I have been able to examine Persoon's type of this species and its variety *lubricum* preserved at Leiden. *(Figs. 71, 72, 154, 155.)* In these the spores measure 55—70 μ long, and the greater number are 1—3-septate. In the American material and in nearly all the other European specimens examined the spores are longer, and the majority become 7-septate. In all other respects the agreement is complete. The type of *G. viscosum* is not present in Persoon's

herbarium. His description indicated a plant much like *Gl. difforme*. But whatever may have been his distinction between the two forms all the European specimens which I have seen under the names *G. glutinosum* and *G. viscosum* beyond a doubt represent a single species. Boudier's recent plate (Icon. myc. **3**. *pl. 422*) does not represent *Gl. glutinosum* Pers., but what is more likely *G. nigritum* Cke.

Material examined:

European: Persoon's specimens at Leiden; Moug. & Nest. Stirp. Crypt. *n. 780*; Roumg. Fung. Gal. *n. 4044*; also British specimens ex herb. C. Crossland.

Ontario: London, *J. Dearness* (D).

New Hampshire: Intervale, *R. Thaxter* (T).

Connecticut: Bolton, *C. C. Hanmer* in herb.; New Haven, *R. Thaxter* (T); Wintergreen Falls, *R. Thaxter* (T).

New York: Adirondack Mts., *C. H. Peck* (A); Croghan, Bethlehem & Old Forge, *Peck* (A); Ithaca, many stations and collectors (CU) (D); Canandaigua, *Durand* (D); Watkins Glen, *Durand* (D).

North Carolina: Blowing Rock, *G. F. Atkinson* in herb. *n. 930*.

Tennessee: Burbank, *R. Thaxter* (T).

2. **Gloeoglossum affine** Durand sp. nov. (Figures 73, 74, 165—167.)

Ascomata gregaria, atra, viscida, 1,5—2,5 cm alta; clavula oblongo-clavata, obtusa, compressa; stipes gracilis, levis. Asci clavati, apice rotundati, 130—160 ⩽ 15 μ; sporidia 8, parallele posita, fuliginea, clavata, 7-septata, 43—65 ⩽ 5—6 μ; paraphyses filiformes, 2,5 μ crassae, sursum clavatae, septatae, curvatae, fuligineae, cellulâ apicali abrupte elliptica vel globosa, 7—8 μ crassa, cellulis inferioribus aut cylindraceis aut nodulosis aut saepe moniliformibus, stipitem usque ad basim tegentes.

Plants solitary or gregarious, black, viscid-gelatinous when fresh, clavate, 1,5—2,5 cm high; ascigerous portion narrowly clavate-oblong, obtuse, compressed, occupying about $^1/_2$ the total length, up to 3 mm thick, not sharply differentiated from the stem; stem slender, smooth. Asci clavate, apex rounded, 130—160 ⩽ 15 μ; spores 8, fasciculate, smoky brown, clavate, 7-septate, 43—65 ⩽ 5—6 μ; paraphyses slenderly cylindrical below, 2,5 μ thick, slightly and gradually thickened above, the terminal portion septate, brownish, the terminal cell abruptly elliptical to globose thickened, 7—8 μ diam., the lower ones either cylindrical or nodulose, or abruptly and conspicuously thickened below the septa, in extreme cases almost globose, either straight or more or less curved or coiled above, and continuing down the stem to its base.

On soil or humus in swamps; August. New York.

Apparently a distinct species, a true *Gloeoglossum* in consistency and paraphysate stem. It is most nearly related to *Gl. glutinosum*, but differs

from it in the shorter, clavate spores always 7-septate, but more especially in the irregular swollen character of the cells of the paraphyses. In extreme cases these are moniliform, while in genuine *Gl. glutinosum* the paraphyses are strictly cylindrical, the terminal cell alone being swollen. The spores have the distinctly clavate form of those of *Geoglossum glabrum* or *G. nigritum* rather than the nearly cylindrical outline of those of *Gl. glutinosum*.

Through the kindness of Prof. Dr. P. A. Saccardo I have been able to compare this with a specimen of *G. glutinosum* var. *minus* Sacc. (Syll. Fung. **8**: 43). I concur in his opinion that our plants are different from the Italian, which is a true *Geoglossum*, and, in my judgment, a dwarf form of *G. nigritum* Cke.

Material examined:

New York: Knoxboro, Oneida Co., Aug. 20, 1904, *H. S. Jackson* (type) (CU) (D); Willsboro Point, Essex Co., Aug., 1901, *C. O. Smith* (CU) a single plant.

3. **Gloeoglossum difforme** (Fr.) Durand (Figures 75—77, 156—160, 162—164).

Geoglossum difforme Fr. Obs. Myc. **1**: 159. 1815 (not of authors).
Geoglossum Peckianum Cke. Hedw. **14**: 10. Ja. 1875; Grev. **3**: 150. Jl. 1875.

Illustrations: Cke. Mycog. *pl. 2, f. 5*; Mass. Ann. Bot. **11**. *pl. 12, f. 42, 43*.

Type: ? in herb. Elias Fries, from Sweden.

Plants solitary or gregarious, sometimes 2—3 together, black, smooth, viscid, especially below, evenly clavate, with no line of demarcation between ascigerous portion and stem, strongly compressed, apex obtuse, 3—6 cm high, 8—14 mm wide; flesh brown, composed of parallel, cylindrical, septate hyphae, rather looser in the center but not hollow. Asci clavate, gradually narrowed from the middle toward the apex, the latter rounded, the apical plug blue with iodine, 240—275 × 18—25 μ; spores 8, in a parallel fascicle in the ascus, brownish fuliginous, clavate-cylindrical, slightly narrowed from the middle each way, ends rounded, straight or slightly curved, smooth, 15-septate at maturity, the cells about as long as wide, 95—125 × 6—7 μ; paraphyses longer than the asci, slender, septate, tips slightly thickened, brownish, much coiled and twisted, continued down the stem to the base.

On soil, humus, decayed wood, or among pine needles in rich woods; July—September. Maine and Ontario to Florida and Michigan.

A splendid species known by the smooth, viscid, evenly clavate, much compressed ascomata, the 15-septate spores, and the paraphyses much coiled at the tips. It is the commonest of the dark-spored species in

the vicinity of Ithaca, and will probably be found frequently throughout the eastern United States.

My conclusion that this is the true *Geoglossum difforme* of Fries is based on the following facts: (1). In the herbarium of Elias Fries, at Upsala, there are two specimens called *G. difforme*. The first is marked "Småland, E. P. Fries" the whole label being in Elias Fries's own handwriting. Whether this is the original type it is impossible to say, but since Fries's early home was in Småland it is probably, at least, one of the earlier collections. At any rate it is the most authentic specimen of the species in existence. Accompanying the packet is a note "Est Geoglossum Peckianum Cke. Karl Starbäck". The second specimen was collected at Upsala, 1866, by Th. M. Fries. The label is not in the hand of Elias Fries, and its late date precludes the possibility of its having been the original of the species. Both of these specimens I was kindly permitted to examine. The first is certainly the *G. Peckianum* Cke. so common in America. *(Figs. 76* and *164.)* The second has hyaline spores and is *Corynetes atropurpureus* (Pers.) Durand. (2). This is the only plant which exactly conforms to the original description. There its consistency is distinctly stated to be "viscosum", and the species is compared with "Geogl. glutinoso et viscoso". I have found no evidence anywhere to justify the interpretation given to *G. difforme* by Cooke and some other more recent writers.

That *Geoglossum Peckianum* has been found in Europe has been shown by Massee, who records a specimen from England, in Sowerby's herbarium (called *G. difforme*), and from France (Boudier). Its rarity in Europe has undoubtedly contributed to the misinterpretation of the species by European writers. I strongly suspect that Persoon's *G. viscosum* is also identical with the present species, but in the absence of authentic specimens we can never know what that species really was.

Material examined:

European: Specimen in herb. Elias Fries as above.

Ontario: London, *J. Dearness* (NY) (D); Toronto, *Dearness* (NY); Swansea, *J. H. Faull* (D).

New England: *Murray n. 5339* (K).

Maine: Orono (NY); York, *R. Thaxter* (T).

New Hampshire: Intervale and North Conway, *R. Thaxter* (T).

Vermont: Grandview Mt., *E. A. Burt* (D).

Massachusetts: Amherst, *S. J. Harkness* (NY); Boston, *G. E. Morris* (A).

Connecticut: West Haven, *R. Thaxter* (T); Rainbow and South Windsor, *C. C. Hanmer* in herb.

New York: Forestbourg, *C. H. Peck* (K); Sandlake, Lake Pleasant, Port Henry, Northampton & Wading River, *Peck* (A); Willsboro Point, *C. O. Smith* (CU) (D); Fisher's Island, *C. C. Hanmer* in herb.; Knoxboro,

H. S. Jackson (D); Ithaca, many localities and collectors (CU) (D), E. & E. F. Col. *n. 1731.*

Delaware: Newark, *H. S. Jackson* (D).
North Carolina: Blowing Rock, *Durand* (CU); Cranberry, *R. Thaxter* (T).
South Carolina: Society Hill, *M. A. Curtis n. 1227* (NY) (C) (K).
Florida: Gainesville, *H. W. Ravenel* (K); Sorrento, *R. Thaxter* (T).
Indiana: Bloomington, *H. B. Brown* (D).
Kentucky: Norwood, *A. P. Morgan* (D).
Tennessee: Burbank, *R. Thaxter* (T).
Michigan: Glen Lake, *C. G. Lloyd* (L).

5. Geoglossum Pers. Römer's N. Mag. für die Bot. **1**: 116. 1794; Obs. Myc. **1**: 11. 1796; Comm. Fung. Clav. 36. 1797.

Ascoma fleshy, erect, stipitate, clavate, hymenium covering only the upper portion, black or brownish black; asci clavate-cylindrical, opening by a pore; spores 8, fascicled or multiseriate in the ascus, cylindrical or clavate-cylindrical, 3—15-septate, fuliginous; paraphyses numerous, septate, usually brownish above, confined to the ascigerous portion.

The salient features of this genus are the clavate, black ascomata, not viscid but fleshy, the elongated, dark spores, and the fact that the paraphyses do not form a thick coating over the stem. *(Fig. 161.)* While scattered or fasciculate hairs similar to the paraphyses may be found on the stem in many species of this genus they never form the dense, conspicuous layer so characteristic of *Gloeoglossum.*

Persoon's original (1794) account is as follows:

„*Pileo* subcompresso ligulato simplici stipiti contiguo breviore.
G. *glabrum.* Clav. *ophiogloss.* L.
G. *hirsutum.* Clav. *atra* Schrad.
G. *lilacinum.* Clav. *atro-purpurea* Batsch.
G. *viride.* Clav. *viridis* Schrad., an Cl. *serpentina* Schrank?"

None of the species enumerated were described, nor had any of the synonyms mentioned been sufficiently characterized to be capable of certain identification at the present time. *G. lilacinum* is probably not ascomycetous. The remaining three species are the types of as many distinct genera.

In 1796 he again described the genus as follows:

„Clavula (simplici) ut plurimum ligulata, stipiti contigua.
17. Geoglossum glutinosum.
18. Geoglossum capitatum.
83. Geoglossum viride.
84. Geoglossum olivaceum."

All of the species mentioned were described with some fullness.

The next year (1797) Persoon gave for the first time a complete account of the genus as he understood it, with full descriptions and

synonymy. The eight species were arranged in the following order: 1. *glabrum*; 2. *hirsutum*; 3. *capitatum*; 4. *glutinosum*; 5. *viscosum*; 6. *purpurascens*; 7. *viride* and 8. *olivaceum*. It is interesting to note that Persoon grouped his species on the basis of external characters exactly as I have done on the basis of internal structure. That is to say, in the present paper number 1 is placed in *Geoglossum*, 2 and 3 in *Trichoglossum*, 4 and 5 in *Gloeoglossum*, 6 in *Corynetes*, and 7 and 8 in *Microglossum*.

In 1799, the same writer again discussed *G. glabrum* at length, and described *G. atropurpureum*. In fact, Persoon discussed the genus *Geoglossum* in nearly every one of his mycological papers from 1794 to 1822. While he nowhere mentions any species as the type, it is impossible to read all that Persoon has written on *Geoglossum* without reaching the conclusion that he regarded *G. glabrum* as the most prominent and typical species of the group. I therefore assume it as the type of the genus.

In collecting and studying specimens of the dark-spored *Geoglossaceae* great care should be taken not to get the species or spores mixed. I have frequently found quite dissimilar species growing together on the same substratum, so that only careful attention at the time of collecting will prevent mixing. In all the species the spores are projected at maturity so that they may be easily transferred from one plant to another either on the fingers or on wrapping paper. Whenever there seems to be a striking variation in spores one should notice only those still within the mature ascus and thus avoid confusion. This is especially important when closely allied species are being studied. Extended study of many hundreds of specimens has shown me that the spores of the different species are far less variable in size and septation than some recent writings on the subject had led me to expect.

A. Paraphyses and asci free above, the apices not agglutinated to form a brown epithecium; spores early becoming brown.
  B. Spores 7, or 7—12-septate at maturity.
    C. Mature spores uniformly 7-septate; ascoma black or brownish black; paraphyses brown above.
      D. Paraphyses normally clavate in the distal third, closely septate, usually constricted or moniliform . . . . . 1. G. glabrum.
      D. Paraphyses remotely septate, scarcely moniliform, the thickening confined to the terminal cell . . . . . 2. G. nigritum.
    C. Mature spores 7—12-septate; ascoma tawny brown; paraphyses nearly hyaline . . . . 3. G. fallax.
  B. Mature spores 15-septate . . . . . 4. G. pygmaeum.

A. Paraphyses and asci agglutinated above forming a conspicuous brown epithecium; spores usually remaining for a long time hyaline.
E. Spores 0—7-septate, paraphyses brown, the tips piriform . . . . . 5. G. cohaerens.
E. Spores 7—12-septate, paraphyses nearly hyaline 6. G. intermedium.
E. Spores 15-septate, clavate-cylindrical . . . . 7. G. alveolatum.

1. **Geoglossum glabrum** Pers. Römer's N. Mag. für die Bot. **1**: 116. 1794; Comm. Fung. Clav. 36. 1797; Obs. Myc. **2**: 61. 1799. (Figures 50—56, 121—129.)
? *Clavaria ophioglossoides* L. Sp. Pl. **2**: 1182. 1753.
Geoglossum sphagnophilum Ehrb. Sylv. myc. ber. 30. 1818.
Geoglossum difforme Cke. Mycog. 6, *pl. 2, f. 7*; Fung. Brit. *n. 481.*
Geoglossum simile Pk. Bull. Buff. Soc. Nat. Sci. **1**: 70. Jl. 1873.

Illustrations: Cke. Mycog., *pl. 2, f. 7* (incorrectly drawn); *pl. 3, f. 9*; Gill. Disc. Fr., *pl. 24, f. 3*; Rehm, Disc. 1145, *f. 1—4*; Mass. Ann. Bot. **11**. *pl. 12, f. 44—46*; Boud. Icon. Myc. **3**. *f. 423.*

Type: European, in herb. Persoon at Leiden.

Plants solitary or rarely clustered, gregarious, 3—7 cm high; ascigerous portion black, about $^1/_3$ the total length of the plant, lanceolate, compressed, 1—3 cm long, 3—8 mm thick, obtuse or acute, not sharply delimited from the stem; stem terete or slightly compressed, brownish black, rather slender, densely squamulose, 2—5 cm high, 1,5—5 mm thick, but commonly about 2 mm. Tissue composed of a fascicle of parallel, septate, brown hyphae, 10—12 μ in dam., those in the center of the ascigerous part loose, those on the surface of the stem projecting to form flexuous, septate hairs up to 100 μ long, single or agglutinated into groups. Asci rather stout, clavate-lanceolate, apex narrowed but rounded, pore blue with iodine, short stipitate, 170—200 × 20 -22 μ; spores 8, in parallel fascicle in the ascus, clavate, dark fuliginous, 7-septate, usually slightly curved, 60—105 × 7—9 μ (the majority 75—95); paraphyses slightly longer than the asci, typically clavate in the distal third, closely septated into cells rarely more than twice as long as broad, usually constricted at the septa and the cells often swollen so as to give a moniliform appearance, brown above, straight or curved, about 3 μ thick below, 5—9 μ thick above.

On very rotten wood, logs, stumps, or rich humus, rarely on soil; July-September. Newfoundland to Florida and California.

This cosmopolitan species is one of the commonest of the dark-spored forms, and will be found to occur throughout our range in suitable situations. The leading characters are the brownish black, compressed ascomata which are not viscid but clammy, the clavate, stout, 7-septate spores, and the closely septate commonly more or less moniliform para-

physes. The characters are quite variable as is to be expected in such a common, widely distributed species. In different specimens the terminal portions of the paraphyses show all gradations between chains of large bead-like cells and those which are nearly cylindrical but closely septate. It often possible to find associated with these single ones which approach those of the next species.

Through the kindness of Dr. Lotsy I have been able to examine the types of *G. glabrum*, *G. glabrum* α *vulgare*, *G. laevipes* Pers. MS., and a specimen of *G. sphagnophilum* Ehrb., in the herbarium of Persoon. Since Ehrenberg's collection of the last named species is the only one mentioned in the Mycologia Europaea, it is probable that the specimen examined is part of the original material. All agree in essential characters and represent a single species. *(Figs. 50—52, 55, 124—129.)* The type of *G. simile* Pk. is typical *G. glabrum* as Dr. Peck himself long since pointed out. *(Fig. 53.)* *G. difforme* Cke. also belongs here *(fig. 56)*.

Although *Clavaria ophioglossoides* L. was quoted by Persoon in several of his earlier writings as synonymous with *G. glabrum*, his later comments show that he was himself in doubt about the identity. All that we know about the Linnaean species may be inferred from Vaillant's *pl. 7, f. 3*, on which it was based. This evidently represents some one of the black Geoglossaceae, but which species as at present understood is unknown, and can probably never be determined.

Material examined (nearly 200 separate collections):

European: Specimens in herb. Persoon as above; Moug. & Nest. Stirp. Crypt. *n. 684;* Roumg. Fung. Gal. *n. 262 & 4043;* Phil. Elv. Brit. *n. 55;* also German col. *Wahlenberg* (F), and English ex herb. C. Crossland.

Newfoundland: St. Johns, *H. Schrenk* (H).

Ontario: London, *J. Dearness* (D); Snelgrove, Toronto & Algonquin Park, *J. H. Faull* (D).

Maine: Otisfield, *J. Blake* (C); Kittery Pt., *R. Thaxter* (T); Bar Harbor, *Miss V. White* (NY).

New Hampshire: Intervale, *R. Thaxter* (T); White Mts., *Miss Minns* (NY).

Vermont: Brattleboro, *Frost* (Fr); Lake Dunmore, *E. A. Burt* (D).

Massachusetts: Thorndike, *S. J. Harkness* (NY); Chestnut Hill, *R. Thaxter* (T).

Rhode Island: East Providence, *W. G. Farlow* (H) (Neb).

New York: Sandlake, *C. H. Peck* (A), type of *G. simile;* Adirondack Mts., Catskill Mts., Lake Pleasant, Piseco, Greig, Forestburg, Albany, Jordanville, Sagerville & Vauchersville, *Peck* (A); Floodwood, *E. A. Burt* (D); Willsboro Pt., *C. O. Smith* (CU); Lake Placid, *G. F. Atkinson* (CU); Ithaca, many collections (CU) (D); Canandaigua & Churchville, *Durand* (D).

New Jersey: Putnam Co., *J. Carey* (C); Newfield, *J. B. Ellis*, N. A. F. *n. 980 & 2031* (CU).

Pennsylvania: Mt. Pocono, *Mrs. Dallas* in E. & E. F. Col. *n. 1730* (CU).

Delaware: Wilmington, *A. Commons* (NY); Newark, *H. S. Jackson* (D).

District of Columbia: *F. J. Braendel* (L).

North Carolina: Blowing Rock, *Durand* (CU); Cranberry, *R. Thaxter* (T).

Florida: Sorrento, *R. Thaxter* (T).

West Virginia: Eglon, *C. G. Lloyd* (L).

Tennessee: Burbank, *R. Thaxter* (T).

Michigan: Bay View, *C. H. Kauffman* (D); Ag. College, *B. O. Longyear* (MAC).

Nebraska: Brown Co., *M. E. Moore* (Neb); Bellevue, *Pound & Saunders* (Neb).

California: *Harkness n. 1393* (K).

2. **Geoglossum nigritum** Cooke, Mycog. 205. *pl. 96, f. 345*. 1878. (Figures 57—59, 130—132).

Illustrations: Cooke l. c.; Peck, Rep. **29**. *pl. 1, f. 20—22.*

Type: in herb. Kew, from Sweden, E. P. Fries.

Plants usually solitary, clavate, black or brownish black, up to 8 cm high; ascigerous portion lanceolate, compressed, rather acute, $^1/_2$ the total length of the plant or less, 2—5 mm thick; stem terete, slender, 1—2 mm thick, furfuraceous, minutely squamulose or almost smooth. Asci clavate or clavate-lanceolate, apex narrowed but rounded, 150—175 $\times$ 18 μ; spores 8, in a parallel fascicle in the ascus, clavate, fuliginous, 7-septate, 54—85 $\times$ 6 μ; paraphyses rather longer than the asci, cylindrical, septated into cells 2—10 times as long as wide, not constricted, rarely slightly swollen below the septa, pale brown above, either only slightly thickened, or the apex of the terminal cell piriform, usually more or less curved.

On wet ground, banks, or among leaves on rich humus, rarely on rotten wood; August—October. Maine to North Carolina and California.

Closely allied to *G. glabrum* but differs in the smoother stem, smaller asci and spores and especially in the remotely septated paraphyses which are slender and thickened only in the terminal cell. It is the *G. difforme* of many writers but not of Cooke or Fries. Cooke figures the paraphyses of that species as cylindrical, but in the Fungi Brit. *n. 481* which he quotes as the basis of his figure they are thickened and moniliform *(fig. 56)*, thus corresponding to *G. glabrum*. When ascomata grow upon rich humus or rotten wood they are commonly large and robust, but on more sterile clay and gravelly banks they are much smaller and more slender, sometimes even minute. Such a condition seems to be *G. gluti-*

nosum var. *minus* Sacc. I have a plant of this form from Saccardo, which is exactly matched by a specimen in the Ellis herbarium from Newfield, N. J. A few of the spores of the latter are 7-septate. *(Figs. 58—59.)*

Material examined:

European: Roumg. F. Gal. *n. 2419;* Rabenh. Herb. Myc. ed. 2 *n. 424.* Also type in herb. Kew, from Sweden, and British specimens ex herb. C. Crossland.

Maine: Kittery Point, *R. Thaxter* (T).

Massachusetts: Swamp near Boston, *Johnston* (T).

Connecticut: South Windsor, *C. C. Hanmer n. 621.*

New York: Sandlake, Gansevoort, Old Forge & Greig, *C. H. Peck* (A); Knoxboro, *H. S. Jackson* in herb. (D); Ithaca, several stations (CU) (D); Watkins & Canandaigua, *Durand* (D).

New Jersey: Newfield, *J. B. Ellis* (NY).

North Carolina: Cranberry, *R. Thaxter* (T); Blowing Rock, *Durand* (CU).

Michigan: Glen Lake, *C. G. Lloyd n. 02516* (L).

California: *W. R. Dudley* (A).

3. **Geoglossum fallax** Durand sp. nov. (Figures 61—64, 133—137.)

? *Geoglossum glabrum* β *paludosum* Pers. Myc. eur. **1**: 194. 1822.

Ascomata solitaria, clavata, fulva vel umbrina, 2—8,5 cm alta; clavula lanceolata, obtusa, compressa, 8—15 mm longa, 3—5 mm lata; stipes gracilis, teres, sursum squamulosus, 1—2 mm crassus. Asci cylindraceo-clavati, apice contracti, poro iodo caerulescente, 150—175 ⩽ 15—18 μ; sporidia 8, subdisticha, cylindraceo-clavata, primo continua et multiguttulata, demum 7—12-septata, 65—105 ⩽ 5—7 μ (plurima 80—100 μ), longe hyalina demum fuliginea; paraphyses filiformes, hyalinae, septatae, sursum curvatae vel circinatae, apicibus abrupte ellipticis vel globosis, 5—6 μ crassis.

Plants solitary, clavate, 2—8,5 cm high, entirely tawny-brown to umber-brown; ascigerous portion $^1/_5$—$^1/_2$ the total length of the plant, lanceolate, obtuse, slightly compressed, about 8—15 mm long, 3—5 mm thick; stem short or elongated and slender, squamulose especially above, slightly thickened upward, 1—2 mm thick below, 2 mm thick above, terete. Asci clavate-cylindrical, the apex narrowed, pore blue with iodine, 150—175 ⩽ 18—20 μ; spores 8, biseriate to multiseriate in the ascus, clavate-cylindrical, straight or curved, at first continuous and multiguttulate, then 3-, finally 7—12-septate, 65—105 ⩽ 5—7 μ (80—100), for a long time hyaline, finally becoming fuliginous; paraphyses entirely hyaline, cylindrical, not closely septate, 5—6 μ thick, usually strongly curved or circinate above, the apex abruptly elliptical to globose thickened.

On clay or loamy soil in woods or on slopes of ravines; July—October. New York and Michigan.

I have seen 12 different collections of this species most of them in the fresh condition. The characters are constant. The color is peculiar in being brown rather than black. The paraphyses are not colored, and are more conspicuously circinate above than those of other species of the genus. The spores resemble those of *G. alveolatum* in remaining for a long time hyaline, so that in some preparations only a few colored ones can be found. The majority of the spores have from 8 to 11 septa. The ectal hyphal layers of the stem become cracked above into squamules exposing the paler tissue beneath.

The three ascomata in the Cornell copy of Moug. & Nest. Stirp. Crypt. *n. 95* belong to this species. *(Fig. 63.)* This number Persoon made the basis of his *G. glabrum* β *paludosum*. Judging from this one copy the present species should be called *G. paludosum* (Pers.). Massee, however, declares that in the Kew copy part of the specimens are *G. glabrum* and part *G. americanum*. If this is true three different species have been confused under this one number. Since no specimens of *paludosum* exist in Persoon's herbarium it is impossible now to find out which, if any, of these forms he had before him when the name was applied. It seems better, therefore, to drop Persoon's name and to take up a new one as above.

There is also a specimen of this species in the herbarium of C. G. Lloyd *(n. 03707)* collected by him in Sweden, in the summer of 1903. It has paraphyses slightly constricted at the septa but agrees otherwise. *(Fig. 64.)*

Material examined:

New York: Ithaca, Coy Glen three collections in 1903, 1904 and 1905 (CU *n. 19197* type); McGowan's woods three collections in 1902 and 1904; Enfield, 1902; Michigan Hollow swamp two collections in 1906.

Michigan: Bay View, *C. H. Kauffman n. 355* (D).

4. **Geoglossum pygmaeum** Gerard sp. nov. (Figures 60, 140—141).

Ascomata pusilla, 0,5—2 cm alta, exsiccata brunneo-atra; clavula tenuis, compressa; stipes gracilis, leniter pilis fuscis septatis obsessus. Asci cylindraceo-clavati, 175—200 × 17—18 μ; sporidia 8, parallele posita, fuliginea, cylindraceo-clavata, 15-septata, 122—140 × 6—7 μ; paraphyses rectae, filiformes, deorsum hyalinae rare septatae, 3 μ crassae, sursum clavatae, fuligineae, septatae, constrictae, cellulis 12—14 μ longis, cellulâ terminali piriformi vel elliptica, 10—14 × 7—8 μ.

Ascomata very small, 0,5—2 cm high, brownish black when dry; ascigerous portion occupying about ½ the total length of the plant, narrow, compressed; stem terete, very slender, minutely hairy. Asci

clavate, apex narrowed, 175—200 ⩽ 17—18 μ; spores 8, in a parallel fascicle in the ascus, brown or fuliginous, cylindrical-clavate, tapering slightly each way from above the middle, 15-septate, 122—140 ⩽ 6—7 μ; paraphyses straight, about as long as the asci, cylindrical, 3 μ thick, pale and sparingly septate below, the apex brown, septated into cells about 12—14 μ long, slightly constricted at the septa, the terminal 2—3 cells clavate-thickened, the apical one usually more swollen and piriform to elliptical in outline, 10—14 ⩽ 7—8 μ.

On ligneous earth, Poughkeepsie, N. Y. July. *W. R. Gerard.*

The above description is drawn from two ascomata preserved in the herbarium of the State Museum, at Albany, and from the accompanying notes. Although they were sent there many years ago marked as above by Gerard, the species does not appear ever to have been published. Since no other specimens are present in Gerard's herbarium, at Poughkeepsie, those in the State Herbarium are undoubtedly the only ones in existence. I should hesitate to describe it from such meagre material were it not one of the most distinct species of the genus. It should be found again in spite of its diminutive size. The spores are like those of *Gl. difforme* or *T. hirsutum*, but it is a true *Geoglossum* with no spines in the hymenium, and the paraphyses are very different from those of both of the species mentioned. The hairs on the stem are like those of *G. glabrum*, and not the cystidia of *Trichoglossum*. *G. pumilum* Winter, from Brazil, seems to differ in the more irregular ascigerous portion, different paraphyses and shorter spores.

5. **Geoglossum cohaerens** Durand sp. nov. (Figures 65, 138—139.)

Ascomata clavata, atra, 2,5—3,5 cm alta; clavula teres vel compressa, obtusa; stipes squamulosus. Asci clavati, 150 ⩽ 12—15 μ; sporidia inordinata, cylindraceo-clavata, longe hyalina demum pallido-brunnea, 0—7-septata, 40—55 ⩽ 5 μ; paraphyses numerosae, filiformes, ascos superantes, rare septatae, apice abrupte clavatae vel piriformes, brunneae, apicibus cohaerentibus epithecium brunneum supra ascos formantibus.

Plants clavate, 2,5—3,5 cm high, black; ascigerous portion about $^1/_2$ the total length, terete or compressed, obtuse; stem squamulose. Asci clavate, 150 ⩽ 12—15 μ; spores 8, multiseriate in the ascus, cylindrical-clavate, straight or curved, for a long time hyaline, later becoming pale brown, continuous to 7-septate, 40—55 ⩽ 5 μ; paraphyses very numerous, rather longer than the asci, cylindrical, sparingly but irregularly septate, the tip rather abruptly clavate to piriform thickened, conspicuously brown above, the apices cohering with amorphous matter to form a brown epithecium above the asci.

On sandy soil in a door yard, Newfield, N. J., Nov. 6 and Dec. 1, 1899, *J. B. Ellis.*

The above description is drawn up from two gatherings from the same spot, now in the Ellis Collection, New York Botanical Garden. I have not seen it fresh. The paraphyses are more conspicuously brown than in the other species of the genus, and strongly resemble those of *Corynetes arenarius*. The usual number of septa is 3—5, but rarely 6 or 7. The nearest allies seem to be *G. fallax* and *G. intermedium*, but they have more numerous septa and nearly hyaline paraphyses.

This species with the two following form a very distinct group of geoglossa, in which the tips of the asci and paraphyses are coalesced with amorphous matter to form a conspicuous brown epithecium, a condition similar to that found in *Corynetes atropurpureus* and *C. purpurascens*. *(Figs. 142, 147–148.)* In all three the spores remain for a long time hyaline, and, in most cases, only a few ultimately become brown. Judging from Cooke's descriptions it seems as if *G. Mülleri* Berk., from Australia, and *G. australe* Cke., from Tasmania, might be related forms. I have not examined specimens, but Massee refers the first to *G. glutinosum*, and the second to *G. glabrum*.

6. **Geoglossum intermedium** Durand sp. nov. (Figures 66–67, 142—144.)

Ascomata solitaria, atra, 3—4,5 cm alta; clavula oblonga vel ovato-lanceolata, compressa, obtusa, 0,75—1,5 cm longa, hymenio exsiccato alveolato; stipes gracilis, teres, flexuosus, brunneo-ater, 0,75—1 mm crassus, sursum pilis flexuosis, septatis, brunneis obsessus. Asci cylindraceo-clavati, iodo caerulescentes, 150—200 ⩒ 20 µ; sporidia 8, bi-multiseriata, crassa, clavata, obtusa, longe hyalina, demum pallide brunnea, 7—11-septata, 55—75 ⩒ 6 µ; paraphyses filiformes, subhyalinae, rectae, rare septatae, sursum clavatae, apice subpiriformes vel subglobosae, apicibus cum ascis cohaerentibus epithecium brunneum formantibus.

Plants solitary, black, 3—4,5 cm high; ascigerous portion $^1/_4$—$^1/_3$ the total length, oblong to ovate-lanceolate, compressed, obtuse or rounded above, usually abruptly narrowed to the stem below, 0,75—1,5 cm long, 2–6 mm broad, the hymenium prettily alveolate when dry, the meshes less than 0,5 mm across; stem slender, terete, usually more or less flexuous, brownish black, 0,75–1 mm thick, nearly smooth below, provided toward the top with slender, flexuous, sparingly septate, obtuse, brown hairs, up to 100 µ long. Asci clavate-cylindrical, very short pediceled, apex narrowed but rounded, 150—200 ⩒ 20 µ, pore deep blue and entire ascus slightly blue with iodine; spores 8, bi-multiseriate, stout, clavate but not much narrowed toward the lower end, ends rounded, somewhat curved, at first hyaline becoming 1—3-septate, finally rather pale brown, 7—11-septate, 55—75 ⩒ 6 µ; paraphyses cylindrical, nearly or quite hyaline, straight or only slightly curved above, sparingly septate, very gradually and slightly thickened upward, the apex tending to become

piriform to globose thickened, the apical portion of the asci and paraphyses agglutinated by an amorphous brown mass.

In swamp, Knoxboro, N. Y., Aug. 20, 1904. *H. S. Jackson* (D type).

Rotten wood, Guelph, Ontario, Aug. 19, 1905. *J. H. Faull* (D).

Intermediate between *G. fallax* and *G. alveolatum*. It resembles the latter externally, but differs in the shorter, much broader spores, which become 7—11-septate, and in the hyaline paraphyses. From *G. fallax* it differs in its black color and alveolate hymenium, besides the shorter spores and straight paraphyses. I saw 8 ascomata from Knoxboro and 7 from Guelph.

7. **Geoglossum alveolatum** Durand (Figures 68—69, 145—148).

Leptoglossum alveolatum (Durand in herb. meo) Rehm, Annal. Myc. **2**: 32. 1904.

Ascomata gregaria, clavata, 1,5—5 cm alta, illa *G. glabri* simulantia; clavula lanceolata, obtusa, compressa, atra, 4—12 mm longa, 3—4 mm lata, hymenio umido levi, exsiccato saepe alveolato; stipes gracilis, teres, 1—2 mm crassus, pilis brunneis, flexuosis, septatis obsessus. Asci cylindraceo-clavati, apice rotundati, poro iodo caerulescente, 150—170 × 15 μ; sporidia 8, parallele posita, gracilia, cylindracea vel deorsum angustioria, longe hyalina, demum 15-septata et pallido-brunnea; paraphyses filiformes, sursum brunneae, septatae, 3 μ crassae, apicibus ellipticis vel globosis, 6—8 μ crassis, cohaerentibus epithecium brunneum formantibus.

Plants solitary or gregarious, with the aspect of *G. glabrum*, slenderly clavate, 1,5—5 cm high; ascigerous portion about $^1/_3$ the total length, lanceolate, obtuse, compressed, black, 4—12 mm long, 3—4 mm thick, when moist with an even surface, which on drying often becomes pitted or distinctly ridged in an alveolate manner; stem slender, terete, 1—2 mm thick, slightly thickened upwards, distinctly squamulose or hairy; flesh black, composed of a fascicle of parallel septate hyphae, 8—10 μ in diam., the ectal ones of the stem being produced to form slender, brown, flexuous, obtuse, septate hairs up to 125 μ long. Asci clavate-cylindrical, apex slightly narrowed but rounded, pore blue with iodine, 150—170 × 15 μ; spores 8, fascicled or multiseriate in the ascus, narrowly cylindrical, straight or curved, ends obtuse, one end sometimes narrower than the other, contents granular, at first continuous, then 7-, finally 15-septate, 60—95 × 4—5 μ, for a long time hyaline but ultimately becoming pale brown or fuliginous; paraphyses conspicuously brown above, cylindrical, septate, 3 μ thick, the tips abruptly elliptical to globose thickened, 6—8 μ thick and agglutinated together into a brown epithecium.

On very rotten wood and logs, in ravines and moist woods; July—August. New York.

I have seen ten different collections of this species, all in the fresh condition. The characters are remarkably constant in the different gatherings, and determine it as one of the best marked species of the genus. It is a peculiar form which may easily be mistaken for a *Corynetes*. The spores remain so long uncolored that I was at first deceived into placing it among the species with hyaline spores. A careful search usually shows one or two asci with dark spores in each preparation. The spores show the further peculiarity of becoming fully septated while still hyaline. The alveolate character of the hymenium is not constant, and is a phenomenon of drying. *G. visculosum* (Hazsl.) Sacc. seems to be a related species.

I have had this species under observation for many years. I first found it in 1894. In 1903, a specimen of my *n. 1686* was sent to Dr. Rehm under the name *Mitrula alveolata* Durand, the name Mitrula being used in the sense of Massee's monograph. It was described in 1904 under the name given above. In connection with the diagnosis Dr. Rehm stated that he had received the same form from Lloyd *(n. 2270)*. collected in Ohio, to which he had given the provisional name *Leptoglossum microsporum* (C. & P.) Sacc. var. *Ohiense* Rehm. The specimen now in Lloyd's herbarium *n. 2270* came from Eglon, W. Virginia (not Ohio), July, 1902. It consists of a mere fragment without hymenium and is undeterminable. I have found brown spores in asci in all of my collections, and the affinities are certainly with *Geoglossum* rather than with *Corynetes (Leptoglossum)*.

Material examined:

On rotten log, Tichenor's Glen, Canandaigua, N. Y., Aug., 1894; Aug. 27, 1902, *n. 1685* & *1686* (type); Aug. 25, 1905; Sept. 7, 1906. All from the same log. (D).

Ithaca: Fall Cr., July 29, 1895; McGowan's woods, Aug. 20, 1902, *W. H. Long*; Freeville, July 21, 1905, *H. S. Jackson*; Taughannock, July 29, 1906, *D. Reddick*; Coy Glen, July 1906. (CU) (D).

6. **Trichoglossum** Boud. Bull. Soc. Myc. Fr. **1**: 110. 1885.
Geoglossum Pers. in part.

Ascoma fleshy, erect, stipitate, clavate, hymenium covering only the upper portion, black; asci clavate, opening by a pore; spores 8, fascicled or multiseriate in the ascus, clavate-cylindrical, up to 15-septate, fuliginous or brown; paraphyses numerous, septate, brown above, confined to the ascigerous portion. Both the stem and hymenium beset with black, thick-walled, acicular spines or cystidia, which are usually longer than the asci.

In my judgment Boudier was perfectly correct in separating this as a genus distinct from *Geoglossum*. Although later writers have not recognized its generic value the majority have accorded it a position as a subgenus of Geoglossum, thus acknowledging its distinctness as a

group. The spines give the ascomata a velvety appearance quite characteristic. The generic type is *T. hirsutum* (Pers.).

In view of the differences of opinion which have existed regarding specific limits in this genus, I have spent much time and labor in the examination of materials. After making mounts from each of the large series of specimens at hand, I have studied the plants alone to see what consistent grouping could be made. External features, structure of sterile parts, cystidia, asci and paraphyses, all were examined and compared, but seem to offer few valuable separating characters. But when one notes the form, size and septation of the spores, the specimens readily fall into several groups which are distinct, and to my mind constitute well marked species. Whatever opinion one may hold as to the relative rank of these groups the fact remains that they are distinct and must be so recognized. The characters mentioned are constant in the hundreds of ascomata examined from widely separated localities. A careful search has failed to reveal any intergrading forms, nor are the various types of spore in any way dependent on age, position in the plant, or conditions of environment, so far as one can judge. The student should be constantly on his guard against the accidental mixing of spores which may cause much confusion. Only those spores which are fully mature and still within the ascus should be depended upon for final judgment. I have frequently found material mixed on account of careless methods of collecting.

A. Spores normally 100—170 μ long, narrowed each way from above the middle.
  B. Spores 4 in each ascus, 8—11-septate . . 1. T. velutipes.
  B. Spores 8 in each ascus.
    C. Spores 15-septate . . . . . 2. T. hirsutum.
    C. Spores 7—14-septate . . . . . T. hirsutum forms.
A. Spores normally 45—100 μ long.
  D. Spores 0—5-septate, clavate-cylindrical . 3. T. Farlowi.
  D. Spores 7-septate.
    E. Spores 55—73 μ long, clavate . . . . 4. T. Rehmianum.
    E. Spores 75—100 μ long, clavate-cylindrical . . . . . 5. T. Walteri.

1. **Trichoglossum velutipes** (Pk.) Durand. (Figures 86—88, 169—173.)
Geoglossum hirsutum var. *Americanum* Cke. Mycog. 3. *pl. 1, f. 1.* 1875.
Geoglossum Americanum (Cke.) Sacc. Syll. Fung. **8**: 46. 1889.
Geoglossum velutipes Pk. Rep. N. Y. S. Mus. **28**: 65. 1876 (Northville specimens).

Illustrations: Cke. l. c.; Peck, Rep. **29**. *pl. 1, f. 16—19.*

Type: in herb. N. Y. S. Mus. from Northville, N. Y.

Plants solitary or gregarious, sometimes cespitose, up to 10 cm high, black or brownish black; ascigerous portion lanceolate, elliptical or subrotund, 1/5—1/3 the total length of the plant, 3—15 mm long, 4—10 mm thick, more or less compressed, rounded above, usually rather sharply delimited from the stem; stem terete, somewhat flexuous, 2—3 mm thick, equal, black, velvety. Asci short stipitate, clavate, apex narrowed, pore blue with iodine, 175—210 × 18 μ; spores 4, in a parallel fascicle in the ascus, smoky brown, narrowed each way from above the middle, 8—11-septate when mature, 115—166 × 6—7 μ (mostly 130—150); paraphyses pale brown, cylindrical, sparingly septate, slightly thickened and curved or uncinate at the tips; spines variable in length, usually projecting 1/3—1/2 their length beyond the asci, sometimes shorter, acicular, black.

On soil, humus, or rotten wood, in late summer. Vermont to North Carolina and Minnesota.

A well marked species known by the tetrasporous asci and 8—11-septate spores. The latter are commonly broader and stouter than those of typical *T. hirsutum*. I do not find the length of the spines of diagnostic value. In two or three specimens examined, including the type of *G. americanum*, they project but little beyond the hymenium; but in all other gatherings including large numbers of ascomata they are longer. There seems to be more variation in the individual plant than there is between groups. Both Cooke and Peck figure the asci with 4 spores, but the character is not mentioned in the descriptions. Gerard's original material is tetrasporous as is all the other seen.

In the original description of *Geoglossum velutipes* Pk. two stations are cited, viz.: "Oneida, N. Y., Warne, and Northville, N. Y." The spores were said to be "at first simple or triseptate, then elongated and nine to eleven-septate", 50—125 μ long. An examination of the original types shows that the Northville specimens have tetrasporous asci, 9—11-septate spores, 142—166 μ long, and correspond in every way to *G. americanum (Figs. 87* and *173)*. The Oneida specimens, on the other hand, have the spores continuous to 3-septate, only 48—65 μ long, and belong to the species later described by Cooke as *G. Farlowi (Figs. 91, 92)*. The long-spored form was regarded by Dr. Peck as the mature condition, being figured by him in the 29th. Report as representing the species. The name *G. americanum* will, therefore, become a synonym of *T. velutipes* which must stand according to the Vienna Rules.

Material examined:

Vermont: *C. G. Pringle* (H).

New York: Poughkeepsie, *W. R. Gerard n. 53* (K) type of *G. hirsutum* var. *americanum*; Bolton & Memphis, *C. H. Peck* (A); Northville, *Peck* (A)

type of *G. velutipes*; Potsdam, *J. B. Ellis* (NY); Ithaca, many collections (CU) (D); Watkins Glen, *Durand* (D).

Delaware: Newark, *H. S. Jackson* (D).

North Carolina: Blowing Rock, *Durand* (CU); Cranberry, *R. Thaxter* (T).

Michigan: Lewiston, *H. C. Beardslee* (B); Bay View, *C. H. Kauffman* (D).

Minnesota: Elk River, Sherburne Co., *Polley* (D).

2. **Trichoglossum hirsutum** (Pers.) Boud. Bull. Soc. Myc. Fr. **1**: 110. 1885. (Figures 78—80, 176—181.)

Geoglossum hirsutum Pers. Römer's N. Mag. für die Bot. **1**: 117. 1794; Comm. Fung. Clav. 37. 1797.

? *Geoglossum capitatum* Pers. Obs. Myc. **1**: 11. 1796.

Illustrations: Cke. Mycog. *pl. 1, f. 3*; Gill. Disc. Fr. *pl. 24, f. 2*; Phill. Disc. *pl. 2, f. 9*; Rehm, Disc. 1145, *f. 5—6*; Mass. Ann. Bot. **11**. *pl. 12, f. 31—32.*

Type: in herb. Persoon, at Leiden.

Plants solitary or gregarious, black, 3—8 cm high; ascigerous portion more or less elliptical or lanceolate in outline, hollow, obtuse, more or less compressed, up to 1,5 cm long, 0,5—0,75 cm thick, usually not more than $^1/_5$ as long as the stem from which it is rather sharply delimited; stem terete, equal, up to 6 cm long, 2—3 mm thick, densely velvety, composed of a fascicle of parallel brown hyphae, 5—8 μ thick, looser in the center, those at the surface projecting as short, septate hairs, giving rise also to numerous acicular black spines up to 225 μ long. Asci broadly clavate, apex narrowed, the pore blue with iodine, 210—225 ⩻ 20—22 μ; spores 8, in a parallel fascicle in the ascus, brown, cylindrical-clavate, broadest above the middle, tapering each way to the obtuse ends, 15-septate at maturity, 100—160 ⩻ 6—7 μ (120—150); paraphyses brown, cylindrical, septate, usually strongly curved or coiled at the slightly thickened tips, 3 μ thick below, up to 8 μ thick above; hymenial spines numerous, usually projecting about $^1/_3$ their length beyond the hymenium, straight, acute, black, opaque, 8—10 μ thick, variable in length.

On rotten wood or on humus among leaves, not uncommon; late summer. Ontario to Louisiana and the West Indies west to California.

This species is readily known from the others of the genus by the long, regularly 15-septate spores, tapering each way from above the middle. The form of the ascigerous portion varies from almost rotund to lanceolate. In Persoon's type the spores are 98—150 μ long the majority being more than 120 μ. *(Figs. 78, 176—177.)* In the same material one occasionally meets with a spore with less than 15 septa, but these are manifestly abnormal. The American specimens agree well with those from Europe. In both places there seems to be a considerable variation in the length of the spores. Some gatherings have none longer than

120 μ, while others have none less than that size. In some individuals may be found all gradations from minimum to maximum length. While *T. hirsutum* is apparently the usual if not the only species of the genus in Europe, it seems to be replaced to a considerable extent in America by other species. *G. capitatum* Pers. is probably nothing more than a form of *T. hirsutum;* but in the absence of specimens there can be no certainty about it.

Material examined:

European: Persoon's type at Leiden; Moug. & Nest. Stirp. Crypt. *n. 94;* Rabenh. F. eur. *n. 523;* Herb. Myc. *n. 237;* Roumg. F. gal. *n. 63;* J., K. & T. Fung. Rossiae *n. 245*. Also specimens from Sweden, *Fries* (F), *Atkinson* (D), *Romell* (D); Russia, *Tranzschel* (D); France, *Quélet* (F); England, *Crossland* (D).

Ontario: Toronto, *J. H. Faull* (D).

Maine: Kittery Point, *R. Thaxter* (T).

New Hampshire: Intervale, *R. Thaxter* (T).

Vermont: Brattleboro, *C. C. Frost* (Fr).

Massachusetts: *Russell* (Mo); *Farlow* (H); Thorndike, *S. J. Harkness* (NY).

Rhode Island: Providence, *J. L. Bennett* (C).

Connecticut: West Haven, *R. Thaxter* (T); Manchester, N. Bloomfield and Waterbury, *C. C. Hanmer* in herb.

New York: Lake Placid, *G. F. Atkinson* (CU); Willboro Point, *C. O. Smith* (CU) (D); Sandlake, Summit, Selkirk, Brewerton & Adirondack Mts., *C. H. Peck* (A); Poughkeepsie, *W. R. Gerard;* Fisher's Island, *C. C. Hanmer* in herb.; Knoxboro, *H. S. Jackson* in herb.; Ithaca, *W. H. Long*, E. & E. Fung. Col. *n. 1729* some specimens (CU); Canandaigua (D).

Pennsylvania: Traxlertown, *W. Herbst* (B) (L).

North Carolina: Blowing Rock, *Durand* (CU).

South Carolina: Santee, *H. W. Ravenel n. 1625* (C) (K).

Louisiana: *Dr. Hale* (C) (K).

Tennessee: Burbank, *R. Thaxter* (T).

Michigan: Kent Co., *B. O. Longyear* (MAC); Battle Creek, *H. M. Sands* (MAC); Glen Lake, *C. G. Lloyd* (L).

Wisconsin: Dalles of the Wisconsin, *W. Trelease* (Mo).

Minnesota: Echo Lake, *W. A. Wheeler* (M); Elk River, *Polley* (M).

California: Marin Co., *Alice Eastwood* (A).

Jamaica, W. I.: *L. M. Underwood* (NY).

Several specimens of *Trichoglossum* have come to hand which are closely related to *T. hirsutum* but differ so constantly from the typical form as to demand special mention.

Forma **variabile** Durand, f. nov. (Figures 84—85, 182—184).

Sporidia 8, variabilia, 80—150 μ longa, 8—14-septata (plurima 11—14-septata); aliter ut in forma typica.

Spores 8 in each ascus, variable in length, 80—150 μ long, 8—14-septate, the majority 11—14-septate. Otherwise as in the typical form.

New York: Knoxboro, Aug. 20, 1904. *H. S. Jackson* (D) Type.

Delaware: Newark, July 26, 1906. *H. S. Jackson n. 1524, 1526* (D).

N. Carolina: Blowing Rock, 1901, *Durand.*

The Knoxboro collection is the most variable in septation and size of spores, but the majority have 11 or more septa. The spines project only slightly beyond the hymenium. The Newark and Blowing Rock specimens are more constant and agree closely in having spores 11—14-septate, 105—150 μ long. The spines project about 1/3 their length. 15-septate spores are extremely rare in the three gatherings.

This form may not be different from the forma *brasiliense* P. Henn. Hedw. **34**: 113. 1895. I have not seen specimens of this which has the same septation, but has spores 150—180 μ long.

Forma **Wrightii** Durand, f. nov. (Figures 83, 174.)

Sporidia 8, 110—140 μ longa, crassa, 8—9-septata; aliter ut in forma typica.

Spores 8 in each ascus, 110—140 μ long, stout, 8—9-septate. Otherwise as in the typical form.

Cuba: Wright, 1857 (H) (C).

I have seen two specimens of this form gathered in Cuba by Wright. Both are at Harvard. About four-fifths of the spores have 8 or 9 septa, while a few scattered ones have 5, 6 or 7. The spores are stouter than in the other forms of *T. hirsutum.* In fact, they exactly duplicate those of *T. velutipes,* but there are 8 spores in the ascus instead of 4 as in that species. This form will, I think, prove to be a distinct species.

Note: Cooke's var. *leotioides,* described from Winton, N. Zealand, seems to have been based on an abnormal condition of *T. hirsutum.* In the herbarium of Elias Fries, at Upsala, is a specimen of the original collection *(Berggren n. 213)* which has the usual clavate form instead of the depressed Leotia-like head of Cooke's material. *(Figs. 81, 82, 175.)*

3. **Trichoglossum Farlowi** (Cooke) Durand. (Figures 89—92, 186—189.)
Geoglossum Farlowi Cke. Grev. **11**: 107. 1883.
Geoglossum velutipes Pk. Rep. N. Y. S. Mus. **28**: 65. 1876 (Oneida specimens).

Type: in herb. Kew, from Massachusetts, Farlow.

Plants solitary or clustered, 2—3 together, gregarious, 2—6 cm high; ascigerous portion lanceolate in outline, not sharply distinguished from the stem, brownish-black, about 1/3 the total length of the plant, 1—3 cm long, 3—5 mm or more thick; stem terete, equal, often flexuous, rarely somewhat compressed, 2 mm thick, 2—4 cm long, black, densely velvety with acicular spines. Asci clavate, apex somewhat narrowed but rounded, pore blue with iodine, 170—200 × 15—18 μ; spores 8, multiseriate in

the ascus, clavate-cylindrical, tapering very little or not at all above the middle, fuliginous or brownish, 48—85 ⩽ 6 μ (60—75), either continuous or 1—3—5-septate; paraphyses cylindrical, septate, curved to circinate at the somewhat thickened tips, brownish above; spines projecting about $^1/_3$—$^1/_2$ their length beyond the hymenium.

In open grassy woods, on humus among leaves or in moss; July—September Vermont to Florida and Mississippi.

This species superficially resembles the others of the genus but differs constantly in the shape, size and septation of the spores. I have seen the type at Kew, besides a portion of the original collection at Harvard. I found one spore in the latter 85 μ long, but this is the maximum the great majority being between 60 and 75 μ. Massee considers this to be a synonym of *T. Walteri*, but it differs constantly in the characters noted.

Material examined:

Vermont: Grand View Mt., *E. A. Burt* (D), E. & E., N. A. F. *n. 3532* (CU).

Massachusetts: Newton, *W. G. Farlow* (K) type, (H); Wellesley, *M. C. Ferguson* (D); Manchester, *W. C. Sturgis* (Neb.); Amherst, *S. J. Harkness* (NY); Naushon, *G. F. Moore* (B); Ellice, *J. H. Faull* (D); New Bedford, *H. P. Burt* (A).

Rhode Island: Providence, *J. L. Bennett* (D).

New York: Fisher's Island, *C. C. Hanmer* in herb.; Oneida, *H. A. Warne* (A) (NY) as *G. velutipes* Pk.; Ithaca, *Jackson & Whetzel* (CU) (D); Sandlake, *C. H. Peck* (A).

New Jersey: Closter, *M. A. Curtis* (Neb); Newfield, *J. B. Ellis* (NY).

North Carolina: Blowing Rock, *Durand* (CU) (D).

Florida: Jacksonville, *Mrs. Curtis* (H).

Mississippi: Biloxi, *S. M. Tracy* (NY).

Tennessee: Burbank, *R. Thaxter* (T).

4. **Trichoglossum Rehmianum** (P. Henn.) Durand (Figures 93, 168).

Geoglossum Rehmianum P. Henn. Hedw. Beibl. **39**: (80). 1900.

Type: at Berlin, from St. Catharina, Brazil, col. Ule *n. 1564*.

Plants solitary, when dry 1,5—2,5 cm high; ascigerous portion $^1/_3$—$^1/_2$ the total length, obovate, even or longitudinally furrowed, rather irregular; stem terete, 1—2 cm high, 1—1,5 mm thick, velvety with black spines. Asci narrowly clavate, apex rounded, 175 ⩽ 12 μ; spores 8, multiseriate, clavate-cylindrical, straight or curved, fuliginous, at first 3- finally 7-septate, 55—73 ⩽ 4—5 μ (60—68 μ); paraphyses pale brown, slightly thickened above, straight or curved; spines projecting but little beyond the hymenium.

On soil, Blowing Rock, N. Carolina, 1901. *E. J. Durand*

I have felt some little hesitation about referring this single collection to the Brazilian species of which I have seen no authentic specimens. The spores agree with those of *T. Walteri* in septation but are smaller and clavate rather than cylindrical. In size and shape they closely resemble those of *T. Farlowi*. I have however, carefully studied material of the latter species from nine states without seeing a single 7-septate spore. In the above described form the great majority of the spores are 7-septate, and those with fewer divisions are plainly immature. It is clearly different from all the other trichoglossa which I have seen, and I refer it to *T. Rehmianum* on the basis of the description only.

5. **Trichoglossum Walteri** (Berk.) Durand (Figures 94—97, 190—193).
Geoglossum Walteri Berk. Hedw. **14**: 39. 1875. Cooke, Mycog. **1**: 4. 1875.

Illustrations: Cooke, Mycog. *pl. 1 f. 4.*

Type: in herb. Kew, from Australia.

Plants solitary or aggregated, 3—7 cm or more high, brownish black; ascigerous portion narrowly elliptical to lanceolate, obtuse, not distinct from the stem, $^1/_3$—$^1/_2$ the total length of the plant, 1—2 cm long, 3—5 mm or more wide, compressed; stem terete or compressed, about 2 mm diam., densely velvety with black, acicular spines. Asci clavate, apex narrowed, obtuse, pore blue with iodine, 175—200 $\lessgtr$ 18—20 μ; spores 8, multiseriate in the ascus, clavate-cylindrical, not narrowed above the middle, fuliginous or pale brown, 82—107 $\lessgtr$ 6 μ (87—100); paraphyses cylindrical, septate, curved at the tips which are slightly thickened and brown. Spines acicular, projecting about $^1/_4$—$^1/_3$ their length beyond the hymenium.

On rotten wood or humus; August—September. New Hampshire to Alabama west to Minnesota.

Resembling other species of the genus externally but well marked by the long, slender, nearly cylindrical spores which become regularly 7-septate at maturity. In the Australian type the plants were said to be „about 1 inch high". The American material is commonly much larger. As will be seen from the figures the spores agree very closely.

Material examined:

Australia: Wild Dog Creek, Apollo Bay (K) type.

New Hampshire: Intervale, *R. Thaxter* (T).

Massachusetts: Newton, *W. G. Farlow* (NY); Chestnut Hill, *R. Thaxter* (T); Waltham, *G. E. Morris* (CU); Amherst, *S. J. Harkness* (NY); Stow, *G. E. Morris* (A).

New York: Willsboro Pt., *C. O. Smith* (CU) (D); Malloryville, *H. S. Jackson* in herb.; Sandlake & Northville, *C. H. Peck* (A).

New Jersey: Newfield, *J. B. Ellis* (NY).

Pennsylvania: Bear Meadows, *Dr. Porter* (H).
Delaware: Newark, *H. S. Jackson* (D).
North Carolina: Blowing Rock, *Miss Schaffer* in herb. G. F. Atkinson *n. 940*.
Alabama: „Ala. superior" *Peters* (C).
Minnesota: Taylor's Falls, Chisago Co., *Miss Hone* (D).

7. **Spathularia** Pers. Römer's N. Mag. für die Bot. **1**: 116. 1794; Comm. fung. clav. 34. 1797.

Ascoma fleshy, erect, stipitate, the ascigerous portion spathulate, much compressed, fan-shaped, decurrent on opposite sides of the stem from which it is sharply delimited; bright colored; asci clavate, opening by a pore; spores 8, fasciculate in the ascus, filiform-clavate, multiseptate; paraphyses present.

Spathularia differs from other genera of the family in having bright colored, spathulate or fan-shaped ascomata. The consistency and spore characters are those of Cudonia. Persoon's original description is as follows:

„Pileo compresso utrinque in stipitem decurrente.
S. *flavida*. Helv. spathul. auctor. Schaeff. tab. 149."

The type species is, therefore, *S. flavida* Pers. = *S. clavata* (Schaeff.) Sacc.

I have been able to distinguish only two species in America:

A. Stem pallid or yellowish pallid; mycelium pale yellow 1. S. clavata.
A. Stem bay-brown, minutely velvety; mycelium orange 2. S. velutipes.

1. **Spathularia clavata** (Schaeff.) Sacc. Mich. **2**: 77. 1882. (Figures 98—100, 220.)

Elvella clavata Schaeff. Icon. fung. **2**. index. *pl. 149*. 1767; **4**: 100. 1774.

Spathularia flavida Pers. l. c.; Myc. eur. **1**: 197. 1822.

Spathularia flava Pers. Comm. fung. clav. 34. 1797; Comm. Schaeff. 59. 1800.

Spathularia flavida var. *rugosa* Pk. Rep. N. Y. State Mus. **39**: 58. 1887.

Spathularia rugosa Pk. l. c. **50**: 118. 1897.

Mitruliopsis flavida Pk. Bull. Torr. Bot. Club. **30**: 100. 1903.

Illustrations: Schaeff. l. c.; Cke. Mycog. *pl. 95, f. 342;* Gill. Disc. fr. *pl. 27, f. 1;* Phill. Disc. *pl. 2, f. 7;* Grev. Scot. Crypt. fl. *pl. 165;* Berk. Outl. *pl. 21, f. 7;* Kromb. Schw. *pl. 5, f. 22;* Fl. Dan. *pl. 658;* Sowerb. *pl. 35*.

Type: European, probably no longer in existence.

Plants solitary or usually gregarious, rarely cespitose 2—3 together, sometimes growing in lines or circles, fleshy, up to 10 cm high, whole

plant pallid when young and fresh, then becoming yellowish or brownish; ascigerous portion darker than the stem, much compressed, fan-shaped, obtuse or rounded, decurrent on opposite sides of the stem, even or undulate or radiately rugose, sometimes contorted, or clavate or almost capitate, occupying about $^1/_3$—$^1/_2$ the total length of the plant, up to $2^1/_2$ cm wide; stem hollow, smooth or farinose, terete or somewhat compressed, tapering slightly upward, often swollen or bulbous below, slightly brownish at the base, up to 1 cm diam.; attached by a pallid or yellowish mycelium; flesh white; plants usually becoming yellowish brown when dry. Asci clavate, apex conspicuously narrowed often submammiform, not blue with iodine, 100—125 $\lessgtr$ 12—14 μ; spores 8, in a parallel fascicle in the ascus, often twisted together above, smooth, clavate-filiform, multiseptate, hyaline, 35—65 $\lessgtr$ 2,5—3 μ (40—50); paraphyses filiform, branched, hyaline, much curled or coiled at the apices, not thickened.

On soil or humus, but most commonly under pines among the needles; July—October. New Brunswick to California, rare or absent in the south.

A common species very variable in form and surface features, but distinguished by the pale color of the whole plant and the pale yellow mycelium. I can find no character or combination of characters to separate *S. rugosa* Pk. from this species. That species was said to have the clubs (ascigerous portions) rugose, the stem more velvety, the spores shorter, and to grow in circles. Nearly all descriptions of European specimens mention the great variability of the surface character (cfr. Schum. Enum. pl. Sael. **2**: 409 „clavula rugosa“: Fries, Syst. Myc. **1**: 491: Rehm, Disc. 1159 „The hymenium, smooth at first, later becomes wrinkled in the most variable manner“). Several figures represent it as distinctly rugose (e. g. Fl. Dan. pl. 658). The habit of growing in circles was mentioned by Persoon (Myc. Eur. **1**: 197). The farinose stem is also present in European exsiccati. I have examined the type, at Albany, and find the spores to be 35—45 μ long, but mostly 40—45 μ („40—60 μ“ Peck). Both Rehm and Schroeter give the length as 45—70 μ. In European exsiccati spores as short as 35—45 μ occur, and I have frequently found them thus in my own collections. Two specimens in the New York State herbarium from Rainbow and Bolton, collected and named *S. rugosa* by Dr. Peck, have the spores 40—55 μ long.

I have seen the type of *Mitruliopsis flavida* Pk., and am compelled to regard it as a depauperate form of *S. clavata*. The structural characters, consistency etc. are identical in every respect. *(Fig. 100.)* The paraphyses instead of being absent as stated are abundant and typical; the spores measure 55—65 μ long, and the ascigerous portion, though narrow, is decurrent on opposite sides of the stem. I have selected examples from my material of *S. clavata*, collected at Ithaca, which exactly match those of the Mitruliopsis.

Material examined:

European: Moug. & Nest. Stirp. *n. 1477;* Roumg. F. Gal. *n. 326;* Rabenh. F. eur. *n. 126*, Herb. myc. *n. 28;* Phil. Elv. Brit. *n. 3;* Rehm, Ascom. *n. 426b.* Also from Sweden, *Romell* (D), and Hungary, *Bäumler* (D).

Prince Edward Island: *Macoun* (NY).

New Brunswick: *G. U. Hay* (H).

Quebec: Little Metis, *J. H. Faull* (D).

Alberta: Laggan, *Miss Hone* (D).

Maine: *Sprague* (H); *Frost* (Fr); Deering, *Fuller n. 22* (K).

New Hampshire: *Miss Minns* (NY); Shelburne, *W. G. Farlow* (NY).

Vermont: Middlebury, *E. A. Burt* (D); ? Brattleboro, *Frost* (Fr).

Massachusetts: New Marlboro, *C. C. Hanmer n. 1339.*

New York: Willsboro Pt., *C. O. Smith* (CU) (D); East Galway (B); Alcove, *C. L. Shear,* N. Y. Fungi *n. 61* (CU); Old Forge, *C. H. Peck* (A) type of *S. rugosa*; Lake Placid, *G. F. Atkinson* (CU); New York City, *F. S. Earle* (NY); Ithaca, *Durand* et al. (CU) (D); Rainbow, Floodwood, Hague, Forestburg, Sandlake, Lake Pleasant, Phoenicia, Old Forge, Westport, Center, Lake Placid, Bolton Landing, Paestenkill, East Worcester, Dean's Mills & Catskill Mts., *C. H. Peck* (A).

Pennsylvania: ? Philadelphia, *Mrs. G. M. Dallas* (L).

Michigan: Lewiston, *H. C. Beardslee* (B) (L); Glen Lake, *C. G. Lloyd* (L).

Wisconsin: Wilson's Island, *L. S. Cheney* (Wis).

Minnesota: Cook Co., *Freemann & Ballard* (M); St. Louis Co. (D).

Iowa: Decorah, *Holway* (Mo) Ellis, N. A. F. *n. 1268*; Winneshiek Co., *B. Shimek* (D).

Colorado: Dark Canyon, *F. E. Clements*, Crypt. Form. Col. *n. 127.*

Idaho: Moscow Mts., Latah Co., *L. F. Henderson n. 5275*, type of *Mitruliopsis flavida* Pk.

California: San Rafael, *J. P. Moore n. 3457* (Cal) called var. *Californica.*

2. **Spathularia velutipes** Cke. & Farlow, Grev. **12**: 37. 1883. (Figures 101, 102, 221, 222.)

Illustrations: Massee, Ann. Bot. **11**. *pl. 13, f. 85—88.*

Type: in herb. Kew, from New Hampshire, W. G. Farlow.

Plants solitary, or usually gregarious, occasionally cespitose several being united by a common base, up to 5 cm high, 1—3 cm wide, fan-shaped; ascigerous portion much compressed, yellowish to brownish-yellow, decurrent on opposite sides of the stem, the margin rounded, even or often wavy or incised or lobed, sometimes contorted, about 1 cm high at the top; stem varying from nearly terete or compressed to broadly expanded and flattened above, rather rounded in outline at its junction with the ascigerous part, 2—4 cm high, up to 1,5 cm broad above, 3—5 mm thick at the base, solid, bay-brown and minutely velvety, attached by an orange mycelium; the plant shrinks but little in drying,

the color becomes brownish and the stem more or less longitudinally rugose or striate. Asci clavate, apex narrowed, not blue with iodine, 80—105 × 10 μ; spores 8, in a parallel fascicle in the ascus, hyaline, smooth, clavate-filiform, straight or curved, becoming multiseptate, 33—43 × 2 μ (35—40 μ); paraphyses filiform, hyaline, branched, strongly curved or coiled at the tips.

On rotten logs, humus among leaves, or especially on the ground under pines; August—September. New Hampshire to North Carolina and Minnesota.

A common species easily known by the bay-brown, minutely velvety stem, and the bright orange mycelium from which the plants arise. Cooke, Massee and others give the measurements of the spores as 55—60 μ long, but I have not succeeded in finding one more than 43 μ long and the majority are less than this. The species is not uncommon in the vicinity of Ithaca, in the humus on the banks of glens. In the North Carolina mountains I found it very abundant under pines. *S. velutipes* is evidently closely allied to *S. rufa* Swartz (not Nees), but is distinguished by the much smaller asci and spores.

Material examined:

New Hampshire: Shelburne, *W. G. Farlow* (K) type, (H), E. & E. N. A. F. *n. 2029*; Center Ossipee, *F. V. Grover* (US); *Miss Minns* (NY).

Vermont: Middlebury, Abby Pond, Ripton, Silver Lake, *E. A. Burt* (B).

Connecticut: Storrs, *C. Thom* (D).

New York: Floodwood, *E. A. Burt* (B); Lake Placid, *G. F. Atkinson* (CU); New York City, *F. S. Earle* (NY); Ithaca, *Durand et al.* (CU) (D); Buffalo, *Clinton* (US); Minerva, Sandlake, Lake Pleasant, Whitehall, Old Forge, Claryville, Rainbow, Karner, Williamstown, East Berne, Osceola & Catskill Mts., *C. H. Peck* (A).

North Carolina: Blowing Rock, *Atkinson and Durand* (CU) (D).

Michigan: *J. P. Gray* (NY); Lewiston, *H. C. Beardslee* (L); Calumet, *Miss Minns* (NY); Glen Lake, *C. G. Lloyd* (L); Michellinda, *Mrs. W. K. Sloan* (US).

Wisconsin: Mason, *L. S. Cheney* (Wis).

Minnesota: Vermilion Lake, *Holway* (NY).

8. **Leotia** Pers. Römer's N. Mag. für die Bot. **1**: 97. 1794.

Hygromitra Nees, Syst. Pilz. und Schw. 157. 1816.

Ascoma more or less gelatinous, stipitate, erect; ascigerous portion pileate, horizontal, supported in the center, bearing the hymenium spread over its upper convex surface, sterile beneath; asci clavate, opening by a pore; spores hyaline, oblong-fusiform, at first continuous, finally 3—5-septate; paraphyses present.

The name Leotia seems to have been used first by Hill (Hist. Pl. 43. 1751), who included under it several indefinite forms without using binomials. It was first definitely described as a genus by Persoon, as follows:

"*Pileo* subrotundato laevi, margine inflexo, undulato.

"*L. lubrica.* Elvella *lubrica* Scop. fl. carn. n. 1687. (Exclus. citat. "Schaeff.) — Bull. Champ. pl. 473, f. 2.

The type species is, therefore, *L. lubrica* (Scop.) Pers.

Species of Leotia can be studied satisfactorily only in the fresh, living condition. Some species change but little in alcohol or formalin, but others, especially *L. lubrica*, have their colors so modified as to be misleading. Preserved material of all species to be of value must be accompanied by carefully made notes on the form and colors of the living plants. Such material without notes is practically worthless for study, so that there is little satisfaction to be derived from attempting to determine dried collections. In such cases one can do little more than guess at the proper disposition of a specimen. One must, therefore, look with suspicion on any "new species" described from such material.

Mr. Geo. Massee in his monograph of the Geoglosseae treats *L. stipitata*, *L. chlorocephala* and *L. Stevensoni* as forms of *L. lubrica* which "are in reality nothing more than phases of development of the present species in passing from north to south. The small, clustered form — *Stevensoni* Berk. — is the more northern condition .... Then follows the typical form; further south we get *chlorocephala* Sz., and finally passing into the warm subtropical region, we have *stipitata* (Bosc) ...., the largest and darkest colored condition of the species .... In the United States the dark green forms being not uncommon, whereas there are but few records of the typical form."

My own field observations both in the north and south have led me to the conclusion that the "forms" mentioned have no relation whatever to latitude. While I too regard *L. Stevensoni* as a form of *L. lubrica* in the case of the others mentioned the condition is different. *L. stipitata* is as common in New York as in North Carolina. Its coloration is perfectly constant in all localities and habitats and in all stages of development. It is just as constantly different from all forms of *L. lubrica*, which is ordinarily yellowishochraceous with a greenish tint, or less commonly olivaceous. The hymenium of *L. lubrica* sometimes assumes a deeper green in the last stages of decay, but it never approaches the deep clear aeruginous green of *L. stipitata*. Both species are commonly viscid-gelatinous and translucent, but in rather dry situations the consistency is firmer. *L. chlorocephala*, on the other hand, is a plant of dryer firmer consistency even when growing in very wet situations.

The stem of *Leotia* consists of three well defined layers. In the center is a core of very loosely interwoven, branched, slender hyphae.

At the summit of the stem this tissue expands to form the whole sterile part of the head. On the surface is a similar cortical layer of varying thickness. Between the two is denser mesal layer forming a cylinder the whole length of the stem, the component hyphae of which are stouter and septate, and cohere so closely as to resemble a pseudo-parenchyma. At the summit of the stem this tissue fades out so that the core and cortical layer become continuous just before the beginning of the hymenium. The core sometimes becomes hollow, and it and the cortex are much more gelatinous than the mesal cylinder.

The following arrangement and descriptions of species are based primarily on a comparative study of the living growing plants.

A. Plants entirely yellowishochraceous, sometimes olivaceous . . . . . 1. L. lubrica.
A. Hymenium aeruginousgreen, stem white to yellowish . . . . . 2. L. stipitata.
A. Plants entirely green, stem furfuraceous, substance firm, plants slender . . . . . 3. L. chlorocephala.

1. **Leotia lubrica** (Scop.) Pers. Römer's N. Mag. für die Bot. **1**: 97. 1794. (Figures 106, 213.)
Elvella lubrica Scop. F. Carn. **2**: 477. 1772.
Helvella gelatinosa Bull. Herb. Fr. 296. *pl. 473, f. 2.* 1791.

Illustrations: Sow. Eng. Fl. *pl. 70*; Fl. Dan. *pl. 719*; Berk. Outl. *pl. 22, f. 1*; Grev. Scot. Crypt. Fl. *pl. 56*; Cke. Mycog. *pl. 44, f. 171*; Gill. Disc. fr. *pl. 23*; Rehm, Disc. 1161, *f. 1—4*; Mass. Ann. Bot. **11**. *pl. 13, f. 61—64*; Atkinson, Mushrooms *f. 221.*

Type: European, probably no longer in existence.

Plants usually densely cespitose, stipitate, more or less viscid-gelatinous, ochraceous-yellow, often with a greenish or olive tint, 3—6 cm or more high; ascigerous portion pileate, convex above, the surface often irregularly furrowed, with a recurved margin, wrinkled or nodulose, 1—1,5 cm or more broad; stem terete or somewhat compressed, usually tapering slightly upward, the adjacent ones often coalescing below, about 1 cm thick below, 0,5 cm above, up to 5 cm or more high, minutely squamulose, sometimes with innate greenish granules. Asci narrowly clavate, apices rounded, slightly narrowed, not blue with iodine, 130—160 ⩽ 10—12 μ; spores 8, biseriate above, uniseriate below, hyaline, smooth, cylindric-oblong to fusiform, ends obtuse or subacute, straight or curved, 18—28 ⩽ 5—6 μ (20—23 μ), at first continuous, then 3—8-guttulate, finally becoming 5—7-septate; paraphyses filiform, branched, the apices clavate to piriform, hyaline, the tips agglutinated by amorphous matter.

On rich humus or sandy soil rarely on rotten wood, in woods: July—September. Ontario to Alabama and Iowa.

Leotia lubrica is perhaps the commonest member of the Geoglossaceae in the eastern United States, frequently occurring in considerable abundance. The great variability of this species has long been a matter of comment, and many of the forms early received names. No other species of the family is so sensitive to the varying conditions of its environment. The form, consistency, and even the color depend much upon the character of the substratum as well as upon the situation of the plant and the consequent amount of moisture supplied to it. In very wet situations or during rainy weather the plants are swollen and soft watery gelatinous or tremellose, but in drier times or in drier situations they are firmer and often cartilaginous. In all cases they shrink much in drying.

Several different forms of Leotia have been reported from America which field studies have convinced me are environmental states of *L. lubrica*. Since, however, certain of these in extreme cases look quite different from the normal condition it seems desirable to distinguish them as forms.

Leotia lubrica forma **Stevensoni** (B. & Br.) Mass. Ann. Bot. **11**: 289. 1897. (Figure 108.)

Leotia Stevensoni B. & Br. Ann. Nat. Hist. V. **3**: 212. 1879.

Plants mostly clustered, of firm consistency, entirely greenish or olivaceous, the stem slightly paler than the hymenium, usually more or less furfuraceous.

On sandy or gravelly soil, coextensive with the typical form.

While the normal color of well developed plants of *L. lubrica* is ochraceous in tone one frequently meets with specimens, especially on sandy or gravelly soil containing but little humus, which are firmer in consistency, have a marked greenish or olivaceous cast on both hymenium and stem, and have the latter more or less furfuraceous. These correspond to *L. Stevensoni* B. & Br., as nearly as one can judge from the brief original description and from the dried type at Kew. In several different localities where material was abundant I have been able to trace every possible gradation between this and the typical form in passing from rich leaf humus to adjacent sandy or gravelly knolls.

Leotia lubrica forma **Lloydii** (Rehm) (Figure 107).

Leotia chlorocephala var. *Lloydii* Rehm, Ann. Myc. **2**: 33. 1904.

Leotia punctipes Peck, Bull. Torr. Bot. Club. **34**: 102. 1907.

Plants usually solitary, slender, entirely olive-ochraceous, rather firm. Stem furfuraceous especially above. On drying the hymenium becomes much darker green or olive, the stem olive-yellow, and more conspicuously beset with green points.

Massachusetts to Michigan; August—September. Probably widely distributed.

I have seen portions of the original collection of Rehm's variety *Lloydii*, and a part of the type of *L. punctipes* which Dr. Peck kindly sent me. While the descriptions of the two forms read quite differently the specimens themselves agree perfectly. Lloyd's numbers *02451*, *02487* and *02488* were collected at Glen Lake, Mich., not Ohio as reported by Rehm. Although the Massachusetts collection was reported as growing „among sphagnum" in my experience the form is more often to be found on rich humus or on rotten wood on the banks of ravines in rather dry situations. A Leotia collected at Sorrento Springs, Fla., by Dr. Thaxter probably belongs here.

When the typical ochraceous form of *L. lubrica* grows on the drier banks of our ravines its consistency is firmer, sometimes almost cartilaginous, and the habit is consequently more slender than usual. This in my opinion is *Leotia marcida* („Fl. Dan.") Pers. All the specimens which I have seen called *L. marcida* are indistinguishable internally from *L. lubrica*.

Material examined:

European: Phil. Elv. Brit. *n. 136;* Romell, F. exs. scan. *n. 96;* Rab. F. eur. *nos. 1501* and *2405;* Krieger, F. saxon. *n. 1137a;* Rab. Herb. myc. *n. 29;* J., K. & T. F. rossiae exs. *n. 96*. Also specimens from Sweden in herb. Fries, and from Hungary (D).

Ontario: Komoka etc., *J. Dearness* (D).

Maine: Bar Harbor, *Miss White* (NY); Harrison, *J. Blake* (D).

New Hampshire: White Mts., *Miss Minns* (NY).

Massachusetts: *S. J. Harkness* (NY); Waltham, *G. E. Morris* (CU); Wellesley, *M. C. Ferguson* (D); Stow, *S. Davis*, type of *L. punctipes* Pk. (A).

Rhode Island: Providence, *J. L. Bennett* (D).

Connecticut: Redding, *F. S. Earle* (NY): Manchester and South Windsor, *C. C. Hanmer* in herb.

New York: Clearwater, *G. F. Atkinson* (CU); Sandlake, Bethlehem, Selkirk, Floodwood, Ampersand, North Elba, Piseco, Greig, Bolton, Ganse-voort, Balston & Port Jefferson, *C. H. Peck* (A); Ithaca, *Durand et al.* (CU) (D) & E. & E. F. Col. *n. 1738;* Watkins, Canandaigua, Victor, Churchville, *Durand* (D); Lydonville, *C. E. Fairman* (D).

New Jersey: Newfield, *J. B. Ellis* (NY) Ellis, N. A. F. *n. 57*, de Thümen, Myc. univ. *n. 1112*.

Pennsylvania: Philadelphia, *Gentry* (NY), *McIlvaine* (L); Sayre, *W. C. Barbour* (NY).

Delaware: Newark, *H. S. Jackson* (D).

North Carolina: *Curtis* (K); Salem, *Schweinitz* (K); Blowing Rock, *Atkinson & Durand* (CU).

South Carolina: *H. W. Ravenel n. 2400* (CU) (K).

Alabama: Auburn, *F. S. Earle* (NY).

West Virginia: Eglon, *C. G. Lloyd* (L).

Ohio: *A. P. Morgan* (US); *C. G. Lloyd* (L); Chillicothe, *M. E. Hard* (CU).
Kentucky: Mammoth Cave, *C. G. Lloyd* (L).
Michigan: Pellston, *C. H. Kauffman* (D); Pleasant Lake, *B. O. Longyear* (MAC); Glen Lake, *C. G. Lloyd* as *L. chlorocephala* var. *Lloydii* Rehm (L).
Wisconsin: *Seymour* (NY); Bluemounds, East Madison & Devil's Lake (Wis).
Minnesota: Ramsey Co., *E. M. Freeman* (M).
Iowa: Decorah, *Holway* (US); Iowa City, *F. J. Seaver* (D).

2. **Leotia stipitata** (Bosc) Schroeter, E. & P. Nat. Pfl. **1**[1]: 166. 1894. (Figures 109, 210.)
Tremella (Hygromitra) stipitata Bosc, Berl. Mag. **15**: 89, *pl. 6, f. 14.* 1811.
Hygromitra stipitata Nees, Syst. 157, *pl. 15, f. 144.* 1816.
Leotia viscosa Fr. Syst. myc. **2**: 30. 1822.

Illustrations: Cke. Mycog. *pl. 44, f. 173;* Mass. Ann. Bot. **11**, *pl. 13, f. 65.* Stem too dark in both cases.

Type: from South Carolina, perhaps in Bosc's collection at Padua.

Plants solitary or clustered, stipitate, viscid-gelatinous, 3—6 cm or more high; ascigerous portion 1—2 cm or more broad, margin incurved toward the stem, even or irregularly nodulose, hymenium clear deep aeruginous green, whitish below; stem terete or tapering slightly upward, usually pure white or less often with an ochraceous or orange tint, 2—4 cm high, 0,5—1 cm thick, often beset, especially above, with minute green squamules. Asci narrowly clavate-cylindrical, not or only slightly narrowed, not blue with iodine, 118—150 ⩽ 10 μ (130—140); spores 8, biseriate above, uniseriate below, hyaline, smooth, at first continuous, finally 5 or more septate, ends obtuse or subacute, straight or curved, 16—28 ⩽ 5—6 μ (20—24); paraphyses filiform, branched, the apices piriform, intense green when fresh.

In rich humus or soil especially among leaves in woods or on the slopes of ravines; August—September. Maine to Florida and California.

The most beautiful and most clearly marked species of the genus, with the habit of robust specimens of *L. lubrica*, but the stem usually paler, and the hyemenium intense aeruginous green. This species is not uncommon about Ithaca and is abundant in the North Carolina mountains, so that I have had good opportunity to study it in all conditions of growth. The colors of the fresh plant are constant under all conditions of moisture, and during all stages of development. The figures of Cooke and Massee represent the stem much too dark. The green squamules are most abundant near the upper end of the stem, and are usually so minute and scattered as to be visible only with a lens. They never give more than the faintest tint of green to the surface. I have

seen no intergrading forms between this and other species. The contrast in color between the hymenium and stem is very marked and the plants appear extremely pretty nestled among the leaves. The hymenium imparts a deep green stain to paper which it touches.

Material examined:

Maine: *Blake* (C).

New Hampshire: *Faxon, Farlow* (H).

Massachusetts: Loc. ig. (K); Waltham, *G. E. Morris* (C. U. *n. 4472*).

Connecticut: Manchester, *C. C. Hanmer* in herb.; Redding, *F. S. Earle* (NY).

New York: Knoxboro, *H. S. Jackson* in herb.; Ithaca, *Durand* et al. (CU) (D); Watkins, Canandaigua, Honeoye, *Durand* (D).

Pennsylvania: *Michener* (C).

Delaware: Newark, *H. S. Jackson* (D).

North Carolina: Salem, *Schweinitz* (S) (K); Blowing Rock, *G. F. Atkinson* in herb., *Durand* (CU) (D).

South Carolina: Aiken, *H. W. Ravenel*, Ellis, N. A. F. *n. 663;* Rav. F. Carol. *fasc. 4 n. 22* (called *L. chlorocephala*), Rav. F. Am. ex. *n. 173;* Santee Canal, *Ravenel* (K).

Florida: Jacksonville, *Calkins*, E. & E. N. A. F. *n. 2032.*

Alabama: Auburn, *F. S. Earle* (NY).

Michigan: Pellston, *C. H. Kauffman* (D).

Iowa: Iowa City, *F. J. Seaver* in herb.

California: *H. W. Harkness n. 1216* (K).

3. **Leotia chlorocephala** L. v. S. Syn. Fung. Car. 114. 1822. (Figures 110, 211, 212.)

Illustrations: Cke. Mycog. *pl. 44, f. 174.* Very poor.

Type: in herb. Phil. Acad. Nat. Sci. from Salem, N. Carolina.

Plants solitary to densely clustered, subgelatinous, entirely green, 1—5 cm high; ascigerous portion hemispherical, convex, margin incurved, obtuse, hymenium smooth or furrowed, the margin often lobed or nodulose, pea-green to aeruginous, 2—10 mm wide; stem terete, firm, the middle layer green, surface densely squamose or furfuraceous with green granules, 1—4,5 cm high, 2—4 mm thick, shrinking much in drying but the color changing but little. Asci narrowly clavate, apex rounded, not blue with iodine, 125—150 $\leqslant$ 10—12 μ, short stipitate; spores 8, subbiseriate above uniseriate below, hyaline or with a faint greenish tint, narrowly elliptical to elliptical-fusiform, ends obtuse or subacute, at first continuous finally about 5-septate, straight or curved, 18—20 $\leqslant$ 5—6 μ; paraphyses filiform, branched, the apices piriform, green.

On sandy soil in rich woods, on knolls, or along wood roads or among mosses in ravines; August—September. New Hampshire to Alabama.

This species may be known by the firm clammy substance which is opaque, not so translucent as in *L. lubrica*, the green color of every part, and the furfuraceous stem. The color of the fresh plant corresponds very closely to that of *Microglossum viride* with which it is often associated. One might well conceive of it as an *M. viride* with the form of a Leotia. One mycologist wrote me about a green „Geoglossum which becomes a Leotia in the mountains". The species is not uncommon in the mountains of North Carolina but seems to be rarer northward. The finest growth I have ever seen was among *Atrichum*, on sandy soil within a few inches of running water, in a ravine near Blowing Rock, North Carolina. Although the moss was very wet the ascomata retained their firm clammy consistency so different from that of *L. lubrica* in drier situations in the same glen.

I was at first inclined to refer our collections to *L. atrovirens* Pers. I have however submitted specimens to Mons. E. Boudier, who has collected what he believes to be that species in France, and who furnished the drawings of it for Cooke's Mycographia. He is of the opinion that our material is different from *L. atrovirens* in that the paraphyses are piriform above, and are branched below rather than near the apices as in that species.

I have been somewhat puzzled to know just how to interpret *Leotia chlorocephala*. I have long been of the opinion that Schweinitz's description actually refers to *L. stipitata*. The plants were said to be large, subpellucid, with the habit of *L. lubrica;* the green color was referred to the pileus only, while the stem was said to be „aetate tegitur pulvere aeruginoso". The name „chlorocephala" itself implies that the head only is green. On the other hand the specimens preserved in Schweinitz's herbarium are certainly not *L. stipitata*, nor do they conform to the description mentioned. I have recently seen other specimens from Schweinitz in the herbaria of Curtis, Fries and Berkeley, all of which agree with those at Philadelphia. All are plants of minor size, were apparently green and of a rather firm consistency, with a somewhat roughened stem. It was undoubtedly this discrepancy between description and specimens which led Ravenel and others to regard *L. chlorocephala* as a small form of *L. stipitata*. The present interpretation of the species is based on Schweinitz's specimens.

Material examined:

New Hampshire: Intervale, *R. Thaxter* (T), with *M. viride*.
Massachusetts: Ellis, *G. E. Morris* (A).
New York: Ithaca, *J. M. Van Hook* (CU), with *M. viride*.
Pennsylvania: *Michener n. 3979* (K).

North Carolina: Salem, *Schweinitz* (S type) (C) (K) (F); Blowing Rock, *Durand* (CU) (D), with *M. viride*.

South Carolina: *H. W. Ravenel n. 1633* (K).

Alabama: Auburn, *F. S. Earle* (NY).

9. Vibrissea Fries, Syst. Myc. **2**: 31. 1822.

Ascoma stipitate, pileate, soft, waxy or subgelatinous; ascigerous portion hemispherical, bearing the hymenium on its upper convex surface, sterile below; asci long cylindrical, narrow, opening by a pore; spores 8, in a parallel fascicle and nearly as long as the ascus, hyaline, filiform, many-septate; paraphyses slender.

Some writers have united *Cudonia* with *Vibrissea*, but they seem to me to represent two well marked generic types. It is much preferable to limit the present genus to fungi with aquatic or semiaquatic habit, soft-waxy or subgelatinous consistency, very narrow cylindrical asci, and extremely slender, filiform, hair-like spores, which are nearly as long as the ascus.

The following quotation from Phillips gives an excellent idea of the habit of the genus: „All the above species of Vibrissea grow on decayed wood which has been for some time immersed in water. Unlike the majority of fungi, nearly the whole of, if not all these plants require partial or complete immersion in water for their complete development, for which reason they should be regarded as aquatic fungi. I have gathered some hundreds of specimens of Vibrissea truncorum in North Wales, nearly all of which flourished under water; and in the few cases where they occurred above the surface of the water the branches of wood on which they grew were entirely submerged.

The stem of *Vibrissea* consists of a bundle of rather stout, parallel, septate hyphae, the cortical ones being constricted at the septa so that a tissue resembling pseudoparenchyma is produced. The superficial hyphae project as rather long, brown, septate hairs. As the stem expands into the head the cortical layer gives place to a pseudoparenchyma, which forms the inferior sterile surface, the subhymenial portion being hyphal.

Two species of the genus occur in North America.

A. Spores 175—250 μ long . . . . . 1. V. truncorum.
A. Spores 85—100 μ long . . . . . 2. V. foliorum.

1. **Vibrissea truncorum** (A. & S.) Fries, Syst. Myc. **2**: 31. 1822. (Figures 111, 112.)

Leotia truncorum A. & S. Consp. Fung. Nisk. 297, *pl. 3, f. 2*. 1805.
Leotia clavus Pers. Myc. eur. **1**: 200, *pl. II, f. II—12*. 1822.
Vibrissea truncorum var. *albipes* Pk. Reg. Rep. **44**: 37. 1891.

Illustrations: Phil. Trans. Linn. Soc. II. **2**, *pl. 1, f. 1—9*: Brit. Disc. *pl. 10, f. 60*; Rehm, Disc. 1164, *f. 1—4*; Mass. Ann. Bot. **11**, *pl. 12, f. 15—17a*: Gill. Disc. fr. *pl. 29, f. 1*; Kromb. *pl. 5, f. 34—36*.

Type: European.

Plants solitary, gregarious or in clusters of 2—3, 4—15 mm high: ascigerous portion hemispherical-convex, margin obtuse, 3—5 mm diam., yellow, orange or reddishorange, rarely pallid; stem terete, up to 1,5 cm high, 1—2 mm thick, white to bluishgray or brownish, minutely squamulose, due to minute spreading hypha, rather darker below. Asci slenderly cylindrical, apex rounded, not blue with iodine, 200—325 × 5—6 μ; spores 8, in a parallel fascicle in the ascus, hyaline, very slenderly filiform, slightly narrowed toward each end, nearly as long as the ascus, multiseptate, up to 250 × 1 μ; paraphyses filiform, occasionally forked, the apices somewhat clavate-thickened and colored.

On wholly or partly submerged sticks etc., in brooks, mostly in higher altitudes; June—August. Labrador to West Virginia, Cascade Mts. and Alaska.

This species is most common in cold mountain brooks, and seems to be abundant where it occurs. Dr. Farlow writes thus of its distribution in the White Mts.: "This species which is seldom found in the lowlands of New England is a common and characteristic species in cold brooks, and is especially abundant along the torrants which fall into King's and Tuckerman's Ravines". I have looked for it in vain in the vicinity of Ithaca, N. Y., and in the mountains of North Carolina. Specimens reach their best development under water, where the long spores project from the asci giving the hymenium a silky appearance, and by their vibration give the name to the genus.

A specimen in the herbarium of Elias Fries, collected in Småland and labled *Vibrissea truncorum* in his own handwriting, has asci about 50 μ long, with elliptical spores 6 × 3 μ. It is an Ombrophila related to *O. violacea*.

Material examined:

European: Moug. & Nest. Stirp. Crypt. *no. 741*, named *Leotia clavus* by Persoon; Roumg. F. Sel. Gal. *no. 536*; Phil. Elv. Brit. *no. 4* and *4bis*: also fresh material collected near Halifax, England.

American: Labrador: "The Straits", *A. C. Waghorne* (Mo).

Newfoundland: *Robinson & Schrenk* (H).

Maine: *Sprague* (H).

New Hampshire: White Mts., *Farlow* (H); *Thaxter* (T).

Massachusetts: *Farlow, Sturgis* (H).

Connecticut: Granby, *C. C. Hanmer* in herb.

New York: Adirondack Mts., *Dr. Peck*, type of var. *albipes* Pk. (A); Sandlake, Indian Lake, Hewitt's Pond, Clear Lake, North Elba, Williamstown, Shawangunk Mts. & Mt. Marcy, *Peck* (A).

New Jersey: Newfield, *J. B. Ellis* (NY), N. A. F. *n. 134*.
West Virginia: Nuttallburg, *L. W. Nuttall* (NY).
Cascade Mts.: *Dr. Lyall*, Oregon Boundary Commission 1861 (Kl.
Alaska: Kadiak Island and Aqua Dulce River, *W. Trelease* (Mo).

2. **Vibrissea foliorum** Thaxter sp. nov. (Figure 113.)

Ascomata gregaria, stipitata, mollia; pars ascigerens convexa, 1—1,5 mm lata, luteo-aurantiaca; stipes pallidus, 2—5 mm longus, gracilis, translucidus, deorsum pilis obsessus. Asci graciles, cylindracei, apice rotundati, iodo non caerulescentes, 150—180 × 5—6 μ; sporidia 8, parallele posita, hyalina, filiformia, 85—100 × 1 μ; paraphyses filiformes, hyalinae, apice leniter piriformes.

Plants solitary or gregarious, stipitate, of soft consistency; ascigerous portion convex, 1—1,5 mm diam., yellowish orange; stem pallid, 2—3 times as long as the diameter of the head, slender, translucent, slightly furfuraceous with projecting hairs below. Asci narrowly cylindrical, apex rounded, not blue with iodine, 150—180 × 5—6 μ; spores 8, in a parallel fascicle in the ascus, hyaline, slenderly filiform, 85—100 × 1 μ; paraphyses filiform, hyaline, not exceeding the asci, simple or occasionally forked near the distal ends, very slightly piriform-thickened at the tips.

On dead oak leaves, acorn cups etc. in a wetplace. West Haven, Conn., *R. Thaxter*. Type in herb. Harvard University.

Very similar to *V. truncorum* in color and habit, but differs in the semiaquatic habitat, and more especially in the smaller asci and spores.

10. **Apostemidium** Karst. Myc. Fenn. **1**: 15, 186. 1871; Boud. Bull. Soc. Myc. Fr. **1**: 111. 1885.

Gorgoniceps Karst. Rev. Mon. 134. 1885 (in part); Sacc. Syll. Fung. **8**: 504. 1889 (in part).

Vibrissea Phill. Trans. Linn. Soc. II. **2**: 8. 1881. Sect. II. Sessile.

Ascoma sessile, turbinate or convex, soft waxy or subgelatinous, hymenium spread on the upper convex or plain surface, sterile below. Asci narrowly cylindrical, opening by a pore; spores 8, in a parallel fascicle in the ascus, hyaline, filiform, many-septate, nearly as long as the ascus; paraphyses present.

Aquatic or semiaquatic fungi with the habitat and fructification of *Vibrissea* but sessile. A condition exactly comparable to this would be produced by removing the stem from a plant like *Vibrissea truncorum* so that the ascigerous portion would be sessile on the substratum. Some specimens are narrowed below, but there is never more than a suggestion of a stem-like base.

Karsten based the genus *Apostemidium* on a single species, *Peziza fiscella* Karst. Later he came to regard the genus as a synonym of his

own *Gorgoniceps*, in which arrangement he was followed by Saccardo who placed it among the Pezizeae. *Gorgoniceps* also was founded to include a single type species, *Peziza aridula* Karst. I have had opportunity to examine authentic specimens of both *Peziza fiscella* and *P. aridula*, and am convinced that they represent distinct generic types. According to the descriptions and specimens (Karsten, Fung. fenn. *n. 750*) *G. aridula* is a fungus of dry situations (at least not aquatic), has short, broadly clavate asci, with spores clavate-filiform, resembling those of *Spathularia* or *Cudonia*. *A. fiscellum* Karst., on the contrary (Fung. fenn. *n. 764*), is an aquatic species, with very narrow asci, long, filiform, hair-like spores, and is clearly congeneric with *Vibrissea Guernisaci* Cr. Indeed, Karsten himself erroneously considered it a synonym of that species. The whole structure, habit and habitat indicate a close relationship with *Vibrissea truncorum*. *Gorgoniceps*, on the other hand, belongs more properly in the Helotiaceae. The genus *Apostemidium* is intermediate between the Geoglossaceae and Mollisiaceae, but its structure is so similar to that of *Vibrissea* that it seems best to place it near that genus. (Cfr. Lagarde, Ann. Myc. 4: 240. 1906.)

The sterile part of the ascoma of *Apostemidium* consists of two portions. A thin subhymenial layer is composed of hyaline interwoven hyphae. Outside of this is a pseudoparenchyma composed of thin-walled, more or less radiating, polygonal cells forming the base, cortex and margin of the cup. The inner cells have hyaline walls while the ectal ones are brown. The latter often project slightly causing the surface to appear furfuraceous. This structure is exactly that of *Vibrissea truncorum*.

In some material specimens otherwise resembling ascigerous ascomata have the "hymenium" consisting of a dense mass of slender, parallel hyphae, with side branches at intervals, each bearing at its apex a minute elliptical conidium about 3×1 μ. Such specimens in general structure resemble the sporodochia of some Tuberculariaceous fungus. While I have seen no asci or paraphyses intermixed with such conidiophores, nor conidiophores in normal ascigerous ascomata, it seems probable that the one form is an imperfect or conidial condition of the other. The two conditions occur intermingled on the same stick. The ascigerous cups are rather larger and more expanded than the others and have a deeper color, otherwise there is little gross difference.

All the American material which I have seen falls into two groups as follows:

A. Paraphyses longer than the asci, repeatedly forked near the apices, the tips abruptly piriform, hyaline 1. A. Guernisaci.

A'. Paraphyses equaling the asci, simple or rarely forked, the ends clavate-thickened, colored . . . 2. A. vibrissecides.

1. **Apostemidium Guernisaci** (Cr.) Boud. Bull. Soc. Myc. Fr. **1**: 111. 1885. (Figures 115—118.)

Vibrissea Guernisaci Cr. Ann. Sci. Nat. IV. **7**: 176. *pl. 4, f. 24—27.* 1857.

Gorgoniceps Guernisaci (Cr.) Sacc. Syll. Fung. **8**: 505. 1889.

Gorgoniceps turbinulata Rehm, Ann. Myc. **2**: 353. 1904.

Illustrations: Crouan l. c.; Gill. Disc. fr. *pl. 29, f. 2*; Pat. Tab. Anal. Fung. *no. 369.*

Type: from near Brest, France.

Ascomata solitary or gregarious, sessile by a rather broad base, turbinate or convex: hymenium plain to convex, bluish-pallid to orange-ochraceous, 1—4 mm diam., even or sometimes wrinkled, often with a dimple in the center, dark brownish below, somewhat furfuraceous. Asci long cylindrical, apex rounded, not blue with iodine, 225—300 × 5—6 μ; spores 8, in a parallel fascicle in the ascus, hyaline, slenderly filiform, multiseptate, 200—250 × 1 μ; paraphyses numerous, filiform, hyaline, longer than the asci, the apical portion (about as much as projects beyond the asci) repeatedly forked or fasciculately branched, the tips abruptly piriform-thickened, hyaline, 4—5 μ thick.

On dead sticks and wood in water; May—August. New England States and Washington.

Distinguished from the next species by the hyaline, peculiarly branched paraphyses, which are longer than the asci. I have not seen Crouan's type nor an authentic specimen of this species. In the original description and figures there are evidently certain inaccuracies of detail, but emphasis is placed on the branching of the paraphyses. The same character is shown in the other illustrations quoted. Patouillard's figure was made from material collected by Boudier, at Montmorency. I have examined specimens of Boudier's collection in the herbarium of Elias Fries, which have the characters described above and agree in structural details with our American material. Phillips's Elv. Brit. *n. 143*, collected in Britain, is also identical, but his figure (l. c. *pl. 4, f. 4*) is quite different, although the above number is quoted in the description. In none of the specimens examined are the apical branches moniliform as originally described.

The color of the hymenium seems to be quite variable in this species. Crouan frères, Patouillard and Phillips describe it variously as being white, greenish-yellow, ochraceous-yellow, gray or bluish-gray. I do not think subdivisions of the species can be made based on color. In August, 1904, I saw a magnificent growth of this species near Halifax, Yorkshire, England. The plants were growing on dead thorn branches in a waterfall where they were constantly saturated by the spray. The hymenium was a clear ochraceous to orange-yellow.

This species was issued in Ellis and Everhart's N. A. F. *n. 2738*, under the name "*Vibrissea turbinulata*" Phil., the latter a misprint for

V. turbinata Phil. Rehm has recently called it *Gorgoniceps turbinulata* (Phil.) Rehm, evidently not having looked up the reference printed on the label. There are no structural differences between it and the other material examined *(Fig. 118)*.

The specimen from Watertown, Mass., mentioned below, was determined by Cooke as *Vibrissea pezizoides* Lib. Whatever may have been its distinctive features when fresh, in the dried state and structurally it is indistinguishable from *A. Guernisaci*.

Apostemidium fiscellum Karst. differs from the present species in having much smaller asci (138—152 μ long) and spores rarely exceeding 100 μ in length *(Fig. 114)*. The specimen called *Gorgoniceps fiscella* (Karst.) Sacc. in Rehm's Ascomycetes *n. 1605* is *A. Guernisaci*.

Material examined:

Maine: York, July 11, 1893, *R. Thaxter* (T).

Massachusetts: Weston, May, 1895, *R. Thaxter* (T); Watertown, May, 1882, *Mrs. Patten* (H).

Connecticut: Milford, June, 1891, *R. Thaxter* (T); West Haven, May, 1889, *R. Thaxter* (T), also E. & E. N. A. F. *n. 2738*, called *V. turbinulata*; July 11, 1900, *R. Thaxter* (T).

Washington: King Co., Mar., 1891 & Aug. 1892, *Miss A. M. Parker* (NY).

2. **Apostemidium vibrisseoides** (Pk.) Boud. Ann. Myc. **4**: 240. 1906. (Figures 119, 120.)

Helotium vibrisseoides Pk. Rep. N. Y. State Mus. **32**: 48. 1879.

? *Vibrissea turbinata* Phil. Trans. Linn. Soc. II. **2**: 8. 1881.

? *Gorgoniceps turbinata* (Phil.) Sacc. Bot. Cent. **18**: 219. 1884.

Gorgoniceps vibrisseoides (Pk.) Sacc. Syll. Fung. **8**: 505. 1889.

Illustrations: Peck, Bull. N. Y. S. Mus. **1**[2]. *pl. 2, f. 7—9*; Phil. l. c. *pl. 2, f. 4; 14—18*?

Type: In herb. N. Y. State Mus. Nat. Hist., from New York.

Plants gregarious, sessile, turbinate, 2—3 mm diam.; hymenium plain to convex, varying in color from bluishpallid to yellowish or ochraceous, base of the cup brownish. Asci long cylindrical, narrow, apex rounded, not blue with iodine, 275—300 × 5—6 μ; spores 8, in a parallel fascicle in the ascus, long filiform, hyaline, multiseptate, up to 250 × 1 μ; paraphyses not numerous, slender, 1—1,5 μ thick below, simple or occasionally forked, the apical portion clavate-thickened, colored, up to 6 μ thick, about as long as the asci.

Decaying sticks lying in the water; May—July. New Hampshire to New York.

The paraphyses of this species are well illustrated by Phillips's *figure 4* (l. c.), called *V. Guernisaci*, and less characteristicly in *fig. 17*, called *V. turbinata*, of which no authentic specimen has been seen. *A.*

vibrisseoides is closely allied to *A. leptosporum* (B. &Br.) Boud. (*Peziza leptospora* B. & Br.; *Vibrissea leptospora* (B. & Br.) Phil.; *Gorgoniceps leptospora* (B. & Br.) Sacc.), with which it may perhaps be identical. But since I have seen no authentic specimen of the latter it is better to use Dr. Peck's name.

There is a specimen in Berkeley's herbarium at Kew, from Vermont, labeled *Patellaria filifera* B. & C., which belongs here. This name has never been published. In the herbarium of Elias Fries is a specimen from Alsace, collected by Quélet, which agrees well with Peck's plant. In August, 1904, in company with Mr. Chas. Crossland, I collected several specimens near Halifax, England, which belong to this species. They were growing on dead sticks etc., in a small rivulet, and showed all gradations in color from horn-color to ochraceous.

Material examined:

New Hampshire: Shelburne, June, 1894, *Dr. Farlow* (H).
Vermont: *n. 5889*, called *Patellaria filifera* B. & C. (K).
New York: Sandlake and Catskill Mts., *C. H. Peck* (A) type.

11. Cudonia Fries, Summa Veg. Scand. **2**: 349. 1848.

Ascoma stipitate, erect, fleshy-leathery; ascigerous portion pileate, hymenium on the upper convex surface, sterile beneath, margin acute, incurved toward the stem; asci clavate, opening by a pore; spores 8, hyaline, clavate-filiform, multiseriate or fasciculate in the upper part of the ascus, multiseptate; paraphyses present.

A genus closely related to *Vibrissea* with which it is united by some writers. It seems to be sufficiently distinct in the terrestrial habit, more leathery consistency, acute margin, short, clavate asci, with the spores clavate-filiform and a little more than one half the length of the ascus.

The veil already described as covering the young hymenium has been observed only in *C. lutea*, but will doubtless be found to be a feature of other species *(Fig. 219)*.

Three species occur in North America.

A. Spores 30—45 μ long; plants pale brownish to buff, often with a rosy tint . . . . . 1. C. circinans.
A. Spores 45—78 μ long; plants entirely yellowish . . 2. C. lutea.
A. Spores 18–25 μ long; cap ochraceous stem white . 3. C. ochroleuca.

1. **Cudonia circinans** (Pers.) Fr. Summa Veg. Scand. **2**: 348. 1849. (Figures 103, 214, 215.)

Leotia circinans Pers. Comm. Fung. Clav. 31. 1797.

Vibrissea circinans (Pers.) Hazsl. M. T. Acad. ért. A. Termés. Kor. **11**: — – (9). 1881.

Illustrations: Pers. Icon. Des. Fung. *pl. 5, f. 5—7*; Bres. Fung. Trident. *pl. 148*; Rehm, Disc. 1163. *f. 1 –4*; Cke. Mycog. *pl. 44, f. 172*; Phil. Disc. *pl. 2, f. 5*.

Type: European, in herb. Persoon, at Leiden.

Plants solitary or gregarious, fleshy, becoming more distinctly leathery in drying, 2—6 cm high; ascigerous portion 0,5—2 cm broad, rather thin, margin acute and recurved, even or undulate, hymenium convex, even or wrinkled or convoluted, cream-buff with a faint rosy tint, or sometimes yellowish or pale brownish; stem tapering slightly upward, often stout below where it is 2—10 mm thick, 1,5—5 mm thick above, darker than the hymenium especially below, often longitudinally striate especially above, the striae being prolonged as radiating veins on the lower side of the cap, somewhat farinaceous, sometimes becoming hollow in age. Asci clavate, apex narrowed, not blue with iodine, 85—130 × 8—10 μ (100—115 μ); spores 8, fasciculate, hyaline, smooth, clavate-filiform, broadest above the middle or at the distal end, 30—45 × 2 μ (34—40 μ); paraphyses hyaline, filiform, strongly curved above, often branched, tips only slightly thickened, 2 μ thick.

On rotten wood or humus among leaves, often under coniferous trees: July—September. Newfoundland to Colorado and Alberta, principally northward.

This species is much less common in the east than *C. lutea*, from which it differs in color and shorter spores. Through the kindness of Dr. Lotsy I have been able to examine a fragment of Persoon's type preserved at Leiden. In this the spores are 30—43 μ long, narrowly clavate, and broadest either at the apex or above the middle. Our American material agrees with this as well as with Persoon's figure. The spore measurements correspond with those given by Saccardo (34—40 μ), Rehm (35—40 μ) and Bresadola (36—45), but do not approximate those of Phillips, Cooke or Massee (50—60 μ).

Material examined:

European: Persoon's type at Leiden; Roumg. F. Sel. *n. 4738*; Rab. F. eur. *n. 38, 312*; de Thüm. Myc. univ. *n. 1809*. Also specimens from Hungary *(Bresadola)*, Sweden collected by *C. G. Lloyd* and *L. Romell* (D), and Pontarlier, France by *G. F. Atkinson* (CU).

Prince Edward Island: (NY).

Newfoundland: Bay of Islands, *A. C. Waghorne* (Mo).

New Hampshire: *Miss Minns* (NY).

New York: Floodwood, *C. H. Peck* (B); Lake Placid, *G. F. Atkinson* (CU); near Ithaca, *C. H. Kauffman* (CU); Adirondack Mts., Cranberry Lake, Lake Placid, North Elba, Westport & Raquette Lake, *Peck* (A).

Michigan: Sailor's Encampment, *Harper* (D); Bay View, *C. H. Kauffman* (D).

Minnesota: Cook Co., *Freeman & Ballard n. 131* (D).

Colorado: Dark Canyon, *Clements:* Crypt. Form. Colo. *n. 128.*

Alberta: Laggan, *Holway* (D).

2. **Cudonia lutea** (Pk.) Sacc. Atti Real. Inst. Venet. VI. **3**: 725. 1885. (Figures 105, 216—219.)

Vibrissea lutea Pk. Bull. Buff. Soc. Nat. Sci. **1**: 70. 1873; Rep. N. Y. State Mus. **25**: 97, *pl. 1, f. 19—23.* 1873.

Leotia lutea (Pk.) Cke. Bull. Buff. Soc. Nat. Sci. **2**: 287. 1875.

Illustrations: Peck l. c.; Massee, Ann. Bot. **11**, *pl. 12, f. 5—7.*

Type: in herb. N. Y. State Mus. Nat. Hist., from North Elba, N. Y.

Plants solitary or gregarious, rarely clustered, 1—6 cm high, but usually about 3 cm, fleshy-leathery; ascigerous portion pileate, convex, the margin acute, reflexed, hymenium when young covered by a volva-like membrane which later cracks irregularly and falls away leaving remnants attached to the margin, usually slightly depressed above, sometimes furrowed, beautiful flesh-color to orange-buff, the under surface often with radiating striae which continue down the stem, 5—15 mm diam.; stem terete or slightly compressed, sometimes inflated below, even or longitudinally striate, mealy, pale yellow, 1—5 cm high, 2—5 mm thick. When dry the whole plant becomes about the color of chamois skin or of *Otidea leporina.* Asci clavate, apex narrowed, not blue with iodine, variable in size, 100—170 × 10—12 μ; spores 8, in a fascicle in the upper part of the ascus, hyaline, smooth, with a hyaline gelatinous sheath, clavate-filiform, lower end acute, not narrowed above the middle, 45—78 × 2 μ (55—65 μ); paraphyses filiform, branched, not thickened but strongly circinate at the tips.

On decaying leaves in thickets, rarely on rotten wood, chestnut burrs etc.; August—September. Ontario to Tennessee, eastward.

This species is distinct from the preceding in the yellow color of every part, and in the longer spores. My measurements of the latter taken from Dr. Peck's type material as well as from numerous other specimens are much smaller than those given by Massee (80—90 μ). The finest developments of *Cudonia lutea* are to be found on rather dry dead beech leaves in beech thickets, where the plants often spread over considerable areas.

Material examined:

Ontario: London and Mc Gillivray, *J. Dearness* (D).

New Hampshire: Shelburne, *W. G. Farlow* (H); Warren, *L. W. Riddle* (D).

Vermont: Middlebury, *E. A. Burt* (D), E. & E., N. A. F. *n. 3533;* Brattleboro, *Frost* (Fr).

New York: North Elba, *C. H. Peck* (A) type; Rainbow, Adirondack Mts. & Catskill Mts., *Peck* (P); Floodwood, *E. A. Burt* (D); Lake Piseco, *G. F. Atkinson* (CU); Lake Placid, *Atkinson* (CU); Ithaca, *W. H. Long et al.* (CU) (D) E. & E. Fung. Col. *n. 1725;* Canandaigua and Churchville, *Durand* (D); Buffalo, *G. W. Clinton* (US).

Tennessee: Burbank, *R. Thaxter* (T).

3. **Cudonia ochroleuca** (C. & H.) Durand (Figure 104).

Leotia ochroleuca Cke. & Hark. Grev. **9**: 8. 1880.

Vibrissea ochroleuca (C. & H.) Mass. Ann. Bot. **11**: 262. 1897.

Illustration: Mass. l. c. *pl. 13, f. 70—72.*

Type: in herb. Kew, from San Rafael, California.

Plants scattered, stipitate, pileate; ascigerous portion convex, „ochroleucus", 6 mm diam. when dry; stem „slender, flexuous, white", longitudinally striate or rugulose, 8—10 mm high; whole plant when dry dark reddish brown, substance apparently not subgelatinous. Asci clavate, slenderly stipitate, apex narrowed, not blue with iodine, 75—100 × 8—9 μ; spores 8, multiseriate in the ascus, clavate-filiform, acute at each end, hyaline, 3-more-septate, 18—25 × 2 μ; paraphyses filiform, very slender.

On damp ground, San Rafael, Cal., Mar., 1880. Harkness *n. 1371.*

I have seen the type at Kew and have examined a portion of the original collection loaned me from the herbarium of the California Academy of Science. If the color of the fresh plant was as described „cap ochroleucus, stem white" it has entirely changed in the dried material. The spores are much shorter than in other species of the genus. So far as I know it has not been found since its original discovery.

Little known or excluded species.

Geoglossum albus A. E. Johnson, Bull. Minn. Acad. Nat. Sci. **1**: 341. 1878.

Mitrula Johnsonii Sacc. Syll. **8**: 36. 1889.

Microglossum album (Johns.) Und. Minn. Bot. Stud. Bull. **9**: 495. 1896.

Mitrula alba (Johns.) Mass. Ann. Bot. **11**: 284. 1897.

„Fasciculate or solitary, smooth; clubs cylindrical, confluent with the stem; stem abruptly black, shading to greenish white; hymenium smooth white; spores white; oblong, $^3/_{80}$ of an inch long.

Plant $^1/_2$ to 2 inches high. On ground and decayed wood, in woods. May."

The above is all that is known about this species. I have tried in vain to get access to the type, and doubt whether it is longer in existence. Nothing like it has been recognized since. I doubt its being an ascomycete.

Geoglossum farinaceum L. v. S. Syn. Fung. Car. 113. 1822.

The type is missing from Schweinitz's herbarium and no specimens are known to exist elsewhere. It is probably not a discomycete.

Spathularia linguatus A. E. Johnson, Bull. Minn. Acad. Nat. Sci. **1**: 370. 1880.

„Head tongue-shaped, flat, thin, nearly even, white, or white tinged with yellow or buff; stem white or yellowish white, thick, solid; asci very long, clavate; sporidia filiform, nearly as long as the asci, straight or curved, multinucleate.

Gregarious, seldom solitary, one to two inches high; head as long or longer than the stem, one-fourth to three-fourths of an inch broad.

On moss in tamarack swamps, October, Scarce."

The above is all that is known about this species. The type is inaccessible and probably no longer in existence. No one beside the describer has ever recognized it. The diagnosis presents no points by which it may be distinguished from *S. clavata.*

Mitrula inflata Fr. Elenchus **1**: 234. 1830.

This is *Physalacria inflata* (Fr.) Pk., a basidiomycete.

Mitrula roseola Morgan, Jour. Cin. Soc. Nat. Hist. **18**: 42, *pl. 3, f. 16.* 1895.

Mr. Morgan later concluded that this was a lichen.

Leotia exigua L. v. S. Syn. Fung. Car. 113. 1822.

Mitrula exigua (L. v. S.) Fr. Elenchus **1**: 235. 1830.

No specimens are known to be in existence, certainly not in the herbaria of Schweinitz or Fries. It was probably Helotiaceous.

Leotia infundibuliformis (Schaeff.) Fr.

Whatever may be thought of the European specimens the one preserved in the Schweinitzian herbarium, from New York, is an Helvella related to *H. elastica.*

Leotia marcida („Fl. Dan") Pers. Syn. 613. 1801.

This species has been reported several times from the United States, but all the specimens which I have been able to examine, both from Europe and America, are indistinguishable internally from *L. lubrica.* See remarks under that species.

Leotia rufa Rostrup, Med. om Grønl. **3**: 536. 1888.

Pileus repandus, margine revoluto, latit. 1—2 mm, rufus; stipes inaequaliter teres, rufo-ferrugineus, altit. 5—6 mm. Asci cylindraceo-clavati, pedicellati, long. 60—70 μ, crass. 2 μ.

Inter muscos. Agdluitsok [Greenland] *(Vahl).*

The above is Rostrup's original description. I saw a small fragment of the original collection in the Botanical Museum, Copenhagen, but did not examine it microscopically. It is probably Helotiaceous.

Cudoniella fructigena Rostrup, Med. om Grønl. **3**: 605. 1891.

A portion of the type growing on fruits of Angelica, in Greenland, generously sent me by Dr. Rostrup, has convinced me that the species

belongs rather in the Helotiaceae. I believe the genus *Cudoniella* to be ill founded since the species thus far referred to it might better be placed elsewhere; e. g. *C. marcida* in Leotia, *C. fructigena* in Ciboria, and *C. aquatica* is *Ombrophila clavus*.

Roesleria hypogaea Thüm. & Pass.

I have seen this species growing on buried grape canes in New York and Missouri. Schroeter placed it in the Geoglossaceae, while Rehm and others regard it as synonymous with *Coniocybe pallida* (Pers.) Körb., and refer it to the Calicieae. Judging from the specimens seen its affinities do not seem to be at all close to the Geoglossaceae, so that I exclude it from that family.

Index and Synonymy.

Apostemidium fiscellum Karst. 457.
„ Guernisaci (Cr.) Boud. 456.
„ leptosporum (B. & Br.) Boud. 458.
„ vibrisseoides (Pk.) Boud. 457.
Clavaria contorta L. v. S. = Microglossum rufum (L. v. S.) Underw.
„ mitrata Holmsk. = ? Corynetes purpurascens (Pers.) Durand.
„ „ var. viridis Holmsk. = ? Microglossum viride (Pers.) Gill.
„ ophioglossoides L. = ? Geoglossum glabrum Pers.
„ phalloides Bull. = Mitrula phalloides (Bull.) Chev.
„ serpentina O. F. Müller = ? Microglossum viride (Pers.) Gill.
„ viridis Schrad. = ? Microglossum viride (Pers.) Gill.
Corynetes arenarius (Rostr.) Durand 417.
„ atropurpureus (Pers.) Durand 414.
„ globosus (Sommf.) Durand 417.
„ luteus (Pk.) Hazsl. = Microglossum rufum (L. v. S.) Underw.
„ microsporus (C. & P.) Hazsl. = Corynetes atropurpureus (Pers.) Durand.
„ purpurascens (Pers.) Durand 413.
„ robustus Durand 416.
Cudonia circinans (Pers.) Fr. 458.
„ lutea (Pk.) Sacc. 460.
„ ochroleuca (C. & H.) Durand 461.
Cudoniella aquatica (Lib.) Sacc. = Ombrophila clavus (A. & S.) Cke. 463.
„ fructigena Rostr. = species of Helotiaceae 462.
„ marcida ("Fl. Dan.") Sacc. = ? Leotia lubrica (Scop.) Pers.
Elvella clavata Schaeff. = Spathularia clavata (Schaeff.) Sacc.
„ cucullata Batsch = Mitrula cucullata (Batsch) Fr.
„ lubrica Scop. = Leotia lubrica (Scop.) Pers.
Geoglossum albus A. E. Johnson = ? 461.
„ alveolatum Durand 432.

Geoglossum Americanum (Cke.) Sacc. = Trichoglossum velutipes (Pk.) Durand.
„ atropurpureum Cke. = Corynetes purpurascens (Pers.) Durand.
„ atropurpureum Pers. = Corynetes atropurpureus (Pers.) Durand.
„ capitatum Pers. = ? Trichoglossum hirsutum (Pers.) Boud.
„ cohaerens Durand 430.
„ difforme Cke. = G. glabrum Pers.
„ difforme Fr. = Gloeoglossum difforme (Fr.) Durand.
„ fallax Durand 428.
„ farinaceum L. v. S. = ? 461.
„ Farlowi Cke. = Trichoglossum Farlowi (Cke.) Durand.
„ glabrum Pers. 425.
„ „ forma difforme Mass. = G. glabrum Pers.
„ „ β paludosum Pers. = ? G. fallax Durand 428.
„ „ α vulgare Pers. = G. glabrum Pers.
„ glutinosum Pers. = Gloeoglossum glutinosum (Pers.) Durand.
„ „ var. lubricum Pers. = Gl. glutinosum (Pers.) Durand.
„ „ var. minus Sacc. = G. nigritum Cke.
„ hirsutum Pers. = Trichoglossum hirsutum (Pers.) Boud.
„ „ var. Americanum Cke. = Trich. velutipes (Pk.) Durand.
„ „ var. leotioides Cke. = Trich. hirsutum (Pers.) Boud.
„ intermedium Durand 431.
„ irregulare Pk. = Mitrula irregularis (Pk.) Durand.
„ laevipes Pers. MS. = G. glabrum Pers.
„ lilacinum Pers. = ? not an ascomycete.
„ luteum Pk. = Microglossum rufum (L. v. S.) Underw.
„ microsporum (C. & P.) = Corynetes atropurpureus (Pers.) Durand.
„ „ var. tremellosum Cke. = C. atropurpureus (P.) Durand.
„ nigritum Cke. 427.
„ olivaceum Pers. = Microglossum olivaceum (Pers.) Gill.
„ ophioglossoides (L.) Sacc. = G. glabrum Pers.
„ Peckianum Cke. = Gloeoglossum difforme (Fr.) Durand.
„ pistillaris B. & Cke. = Microglossum rufum (L. v. S.) Underw.
„ purpurascens Pers. = Corynetes purpurascens (Pers.) Durand.
„ pygmaeum Gerard 429.
„ Rehmianum P. Henn. = Trichoglossum Rehmianum (P. Henn.) Durand.
„ rufum L. v. S. = Microglossum rufum (L. v. S.) Underw.
„ simile Pk. = G. glabrum Pers.
„ sphagnophilum Ehrb. = G. glabrum Pers.
„ tremellosum Cke. = Corynetes atropurpureus (Pers.) Durand.
„ velutipes Pk. = Trichoglossum velutipes (Pk.) Durand.

Geoglossum velutipes Pk. pars = Trichoglossum Farlowi (Cke.) Durand.
„ viride Pers. = Microglossum viride (Pers.) Gill.
„ viscosum Pers. = ? Gloeoglossum glutinosum or Gl. difforme.
„ vitellinum Bres. = Mitrula vitellina (Bres.) Sacc.
„ Walteri Berk. = Trichoglossum Walteri (Berk.) Durand.
Gloeoglossum affine Durand 420.
„ difforme (Fr.) Durand 421.
„ glutinosum (Pers.) Durand 419.
Gorgoniceps Guernisaci (Cr.) Sacc. = Apostemidium Guernisaci (Cr.) Boud.
„ leptospora (B. & Br.) Sacc. = Apostemidium leptosporum (B. & Br.).
„ turbinata (Pk.) Sacc. = ? Apostemidium vibrisseoides (Pk.) Boud.
„ turbinulata Rehm = Apostemidium Guernisaci (Cr.) Boud.
„ vibrisseoides (Pk.) Sacc. = Apostemidium vibrisseoides (Pk.) Boud.
Helote viridis (Pers.) Hazsl. = Microglossum viride (Pers.) Gill.
Helotium vibrisseoides Pk. = Apostemidium vibrisseoides (Pk.) Boud.
Helvella gelatinosa Bull. = Leotia lubrica (Scop.) Pers.
„ laricina Vill. = ? Mitrula phalloides (Bull.) Chev.
Heyderia cucullata (Batsch) Boud. = Mitrula cucullata (Batsch) Fr.
Hygromitra stipitata Nees = Leotia stipitata (Bosc) Schroeter.
Leotia atropurpurea Corda = Corynetes purpurascens (Pers.) Durand.
„ chlorocephala L. v. S. 450.
„ „ var. Lloydii Rehm = L. lubrica forma Lloydii (Rehm) Durand.
„ circinans Pers. = Cudonia circinans (Pers.) Fr.
„ clavus Pers. = Vibrissea truncorum (A. & S.) Fr.
„ elegans Berk. = Mitrula phalloides (Bull.) Chev.
„ exigua L. v. S. = ? 462.
„ infundibuliformis L. v. S. = Helvella sp.
„ lubrica (Scop.) Pers. 446.
„ „ forma chlorocephala Mass. = L. chlorocephala L. v. S.
„ „ „ Lloydii (Rehm) Durand 447.
„ „ „ Stevensoni (B. & Br.) Mass. 447.
„ „ „ stipitata Mass. = L. stipitata (Bosc) Schroeter.
„ lutea (Pk.) Cke. = Cudonia lutea (Pk.) Sacc.
„ marcida ("Fl. Dan.") Pers. = ? L. lubrica (Scop.) Pers.
„ Mitrula Pers. = Mitrula cucullata (Batsch) Fr.
„ ochroleuca C. & Hark. = Cudonia ochroleuca (C. & H.) Durand.
„ punctipes Pk. = L. lubrica forma Lloydii (Rehm) Durand.
„ rufa Rostr. = species of Helotiaceae 462.
„ Stevensoni B. & Br. = L. lubrica forma Stevensoni (B. & Br.) Mass.
„ stipitata (Bosc) Schroeter 449.
„ truncorum (A. & S.) = Vibrissea truncorum (A. & S.) Fr.
„ uliginosa Grev. = Mitrula phalloides (Bull.) Chev.
„ viscosa Fr. = L. stipitata (Bosc) Schroeter.

Leptoglossum (Cke.) Sacc. = Corynetes Hazsl.
„ alabamense Underw. = Microglossum viride (Pers.) Gill.
„ alveolatum (Durand) Rehm = Geoglossum alveolatum Durand.
„ fumosum Pk. = Microglossum fumosum (Pk.) Durand.
„ latum Pk. = Corynetes arenarius (Rostr.) Durand.
„ lutescens (B. & C.) Rehm var. mitruloides Rehm = Microglossum rufum (L. v. S.) Underw.
„ luteum (Pk.) Sacc. = Microglossum rufum (L. v. S.) Underw.
„ „ var. fumosum Pk. = Microglossum fumosum (Pk.) Durand.
„ microsporum (C. & P.) Sacc. = Corynetes atropurpureus (Pers.) Durand.

Microglossum Sacc. = Corynetes Hazsl.
„ album (Johns.) Underw. = see Geoglossum albus Johns. 461.
„ arenarium Rostr. = Corynetes arenarius (Rostr.) Durand.
„ atropurpureum Karst. = Corynetes atropurpureus (Pers.) Durand.
„ atropurpureum Sacc. = Corynetes purpurascens (Pers.) Durand.
„ contortum Pk. = Microglossum olivaceum (Pers.) Gill.
„ fumosum (Pk.) Durand 408.
„ longisporum Durand 409.
„ obscurum Pk. = M. olivaceum (Pers.) Gill.
„ olivaceum (Pers.) Gill. 409.
„ rufum (L. v. S.) Underw. 406.
„ viride (Pers.) Gill. 411.
„ vitellinum (Bres.) Boud. = Mitrula vitellina (Bres.) Sacc.

Mitrula alba (Johns.) Mass. = see Geoglossum albus Johns.
„ arenaria (Rostr.) Mass. = Corynetes arenarius (Rostr.) Durand.
„ crispata Berk. = M. irregularis (Pk.) Durand.
„ cucullata (Batsch) Fr. 402.
„ elegans (Berk.) Fr. = M. phalloides (Bull.) Chev.
„ exigua (L. v. S.) Fr. = see Leotia exigua L. v. S.
„ glabra Karst. = Corynetes atropurpureus (Pers.) Durand.
„ globosa Sommf. = Corynetes globosus (Sommf.) Durand.
„ gracilis Karst. 403.
„ „ var. flavipes Pk. = M. gracilis Karst.
„ Heyderi Pers. = M. cucullata (Batsch) Fr.
„ inflata Fr. = Physalacria inflata (Fr.) Pk.
„ irregularis (Pk.) Durand 398.
„ Johnsoni Sacc. = see Geoglossum albus Johns.
„ laricina (Vill.) Mass. = M. phalloides (Bull.) Chev.
„ luteola Ellis = M. irregularis (Pk.) Durand.
„ lutescens Berk. = Microglossum rufum (L. v. S.) Underw.
„ macrospora Mass. = Corynetes atropurpureus (Pers.) Durand.

Mitrula microspora (C. & P.) Mass. = Corynetes atropurpureus (Pers.) Durand.
„ muscicola P. Henn. 404.
„ olivacea (Pers.) Sacc. = Microglossum olivaceum (Pers.) Gill.
„ paludosa Fr. = M. phalloides (Bull.) Chev.
„ phalloides (Bull.) Chev. 400.
„ pistillaris (B. & Cke.) Sacc. = Microglossum rufum (L. v. S.) Underw.
„ purpurascens (Pers.) Mass. = Corynetes purpurascens (Pers.) Durand.
„ roseola Morgan = a lichen.
„ rufa (L. v. S.) Sacc. = Microglossum rufum (L. v. S.) Underw.
„ viridis (Pers.) Karst. = Microglossum viride (Pers.) Gill.
„ vitellina (Bres.) Sacc. 399.
„ „ American authors = M. irregularis (Pk.) Durand.
„ „ *irregularis (Pk.) Sacc. = M. irregularis (Pk.) Durand.
Mitruliopsis flavida Pk. = Spathularia clavata (Schaeff.) Sacc.
Peziza aridula Karst. = Gorgoniceps aridula Karst.
„ fiscella Karst. = Apostemidium fiscellum Karst.
„ leptospora B. & Br. = Apostemidium leptosporum (B. & Br.) Durand.
Roesleria hypogaea Thüm. & Pass. = Calicieae 463.
Spathularia clavata (Schaeff.) Sacc. 441.
„ flava Pers. = S. clavata (Schaeff.) Sacc.
„ flavida Pers. = S. clavata (Schaeff.) Sacc.
„ „ „ var. Californica Moore (name only) = S. clavata.
„ „ „ „ rugosa Pk. = S. clavata (Schaeff.) Sacc.
„ linguatus A. E. Johnson = ? S. clavata (Schaeff.) Sacc. 462.
„ rugosa Pk. = S. clavata (Schaeff.) Sacc.
„ velutipes Cke. & Farl. 443.
Sprageola Americana Mass. = Mitrula irregularis (Pk.) Durand.
Thuemenidium atropurpureum O. Kze. = Corynetes purpurascens (Pers.) Durand.
Tremella stipitata Bosc = Leotia stipitata (Bosc) Schroeter.
Trichoglossum Farlowi (Cke.) Durand 438.
„ hirsutum (Pers.) Boud. 436.
„ „ forma variabile Durand 437.
„ „ „ Wrightii Durand 438.
„ Rehmianum (P. Henn.) Durand 439.
„ velutipes (Pk.) Durand 434.
„ Walteri (Berk.) Durand 440.
Vibrissea foliorum Thaxter 454.
„ Guernisaci Cr. = Apostemidium Guernisaci (Cr.) Boud.
„ leptospora (B. & Br.) Phil. = Apostemidium leptosporum (B. & Br.) B.
„ lutea Pk. = Cudonia lutea (Pk.) Sacc.
„ ochroleuca (C. & H.) Mass. = Cudonia ochroleuca (C. & H.) Durand.
„ truncorum (A. & S.) Fr. 452.
„ „ var. albipes Pk. = V. truncorum (A. & S.) Fr.

Vibrissea turbinata Phil. = ? Apostemidium vibrisseoides (Pk.) Boud.
" "turbinulata Phil." = Apostemidium Guernisaci (Cr.) Boud.
Xanthoglossum luteum (Pk.) O. Kze. = Microglossum rufum (L. v. S.) Underw.
" microsporum (C. & P.) O. Kze. = Corynetes atropurpureus (Pers.) Durand.

Department of Botany, Cornell University, Ithaca, N. Y.

Explanation of Figures.

All the line figures were drawn with the aid of a camara lucida. Figures 1—7, 98—120 were made with a B. & L. one-inch ocular and one-eight objective; figures 8—97 were made with a one-sixth objective. The exact magnification is indicated on each plate. The photomicrographs were made with a one-inch ocular and one-sixth objective. The magnification is indicated by the scale (10 μ) at the bottom of each plate.

Fig. 1. *Mitrula cucullata.* Ascus, paraphysis and 4 spores from a specimen in herb. Persoon, called *Leotia Mitrula* Pers.
Fig. 2. *Mitrula muscicola.* 3 asci, paraphysis and 4 spores from specimen collected in Alberta by Miss Hone.
Fig. 3. *Mitrula gracilis.* Ascus, paraphysis and 5 spores from Karsten's type collected in Finland.
Fig. 4. *M. gracilis.* Ascus, paraphysis and 3 spores from Peck's type of var. *flavipes*, from Newfoundland.
Fig. 5. *Mitrula vitellina.* 5 spores from specimen collected in Tenn.
Fig. 6. *M. vitellina.* 5 spores from specimen collected in the Tyrol by Bresadola.
Fig. 7. *Mitrula irregularis.* 5 spores from Ontario, coll. Faull.
Fig. 8. *M. irregularis.* Complex of asci and 1 spore from Ontario.
Fig. 9. *Microglossum rufum.* Ascus, 2 paraphyses and 3 spores from specimen collected at Ithaca, N. Y.
Fig. 10. *M. rufum.* Ascus, 2 paraphyses and 4 spores from Peck's type of *Geoglossum luteum*, from Sandlake, N. Y.
Fig. 11. *M. rufum.* Ascus, 3 paraphyses and 5 spores from specimen in herb. Lloyd named *Leptog. lutescens* var. *mitruloides* by Rehm.
Fig. 12. *M. rufum.* Ascus, 2 paraphyses and 4 spores from the type of *Mitrula lutescens*, from S. Carolina.
Fig. 13. *M. rufum.* Ascus, paraphysis and 5 spores from the type of *Geoglossum pistillaris*, from Louisiana.
Fig. 14. *M. rufum.* Ascus, paraphysis and 4 spores from the type of *Geoglossum rufum* L. v. S., from New Jersey.
Fig. 15. *Microglossum fumosum.* 2 asci, 2 paraphyses and 5 spores from specimen collected at Ithaca, N. Y.

Fig. 16. *M. fumosum.* Ascus, 2 paraphyses and 9 spores from a specimen collected at Sandlake, N. Y. by Dr. Peck.

Fig. 17. *Microglossum longisporum.* Ascus, 2 paraphyses and 5 spores from specimen collected at Ithaca, N. Y.

Fig. 18. *M. longisporum.* 2 asci, 2 paraphyses and 5 spores from the type collected at Ithaca, N. Y.

Fig. 19. *Microglossum olivaceum.* Ascus, paraphysis and 4 spores from specimen collected at Ithaca, N. Y.

Fig. 20. *M. olivaceum.* 2 asci, paraphysis and 2 spores from the original collection of *M. obscurum* Pk., collected in Ontario.

Fig. 21. *M. olivaceum.* 2 asci, paraphysis and 2 spores from the type of *M. contortum* Pk., from the Dist. of Columbia.

Fig. 22. *M. olivaceum.* Ascus, paraphysis and 4 spores from specimen collected at Ithaca, N. Y.

Fig. 23. *Microglossum viride.* Ascus, 2 paraphyses and 9 spores from Persoon's type of *Geoglossum viride.*

Fig. 24. *M. viride.* Ascus, paraphysis and 3 spores from the type of *Leptoglossum alabamense* Und.

Fig. 25. *M. viride.* Ascus, paraphysis and spore from specimen collected at Blowing Rock, N. Car.

Fig. 26. *M. viride.* 2 asci, 2 paraphyses and 7 spores from specimen collected at Ithaca, N. Y.

Fig. 27. *Corynetes atropurpureus.* Ascus, paraphysis and 11 spores from Persoon's type of *Geoglossum atropurpureum*, at Leiden.

Fig. 28. *C. atropurpureus.* Ascus and 3 spores from specimen in herb. Elias Fries collected in Finland by Karsten.

Fig. 29. *C. atropurpureus.* Ascus and 9 spores from specimen collected in New Hampshire.

Fig. 30. *C. atropurpureus.* Ascus, paraphysis and 3 spores from portion of the original collection of *G. microsporum* Pk., collected at Greig, N. Y.

Fig. 31. *C. atropurpureus.* 3 spores from an English specimen collected by Bucknall.

Fig. 32. *C. atropurpureus.* 4 spores from Phillips, Elv. Brit. *n. 55.*

Fig. 33. *C. atropurpureus.* 4 spores from specimen in herb. Elias Fries, collected in Sweden, labeled *G. difforme.*

Fig. 34. *C. atropurpureus.* 6 spores from the type of *Geoglossum tremellosum*, collected in Scotland.

Fig. 35. *C. atropurpureus.* Ascus, paraphysis and 8 spores from specimen from original collection of *G. microsporum* in herb. N. Y. State Museum.

Fig. 36. *Corynetes purpurascens.* 2 asci, 3 paraphyses and 3 spores from specimen collected in Sweden by Romell.

Fig. 37. *C. purpurascens.* Ascus, 4 paraphyses and 5 spores from specimen collected at Kittery Pt., Maine.

Fig. 38. *C. purpurascens.* Ascus, 7 paraphyses and spore from specimen collected at Knoxboro, N. Y.

Fig. 39. *C. purpurascens.* Ascus, 2 paraphyses and 6 spores from specimen named *Geoglossum purpurascens* by Persoon, in herb. Kew.

Fig. 40. *Corynetes robustus.* 2 asci, paraphysis and 4 spores from specimen collected at Ithaca, N. Y.

Fig. 41. *C. robustus.* 2 asci and 10 spores from specimen collected at Ocean Springs, Miss.

Fig. 42. *C. robustus.* Ascus, 3 paraphyses and 7 spores from type collected at Blowing Rock, N. Car.

Fig. 43. *C. robustus.* Ascus, paraphysis and 7 spores from specimen collected at Sherborn, Mass.

Fig. 44. *C. robustus.* Ascus and 3 spores from specimen collected at S. Billerica, Mass.

Fig. 45. *Corynetes arenarius.* 4 paraphyses and 7 spores from specimen collected in Labrador. In herb. Missouri Bot. Garden.

Fig. 46. As last, but from specimen in herb. N. Y. Bot. Garden. Ascus.

Fig. 47. *C. arenarius.* Ascus, 3 paraphyses and 4 spores from specimen collected in Newfoundland, named *L. latum* by Peck.

Fig. 48. *C. arenarius.* Ascus, 2 paraphyses and 2 spores from type specimen collected in Greenland. Ex herb. Rostrup.

Fig. 49. *C. arenarius.* Ascus, 5 paraphyses and 8 spores from specimen collected in Denmark. Ex herb. Rostrup.

Fig. 50. *Geoglossum glabrum.* Ascus, 6 paraphyses and 4 spores from Persoon's type, at Leiden.

Fig. 51. *G. glabrum.* Ascus, 2 paraphyses and 2 spores from Persoon's type of the var. α.

Fig. 52. *G. glabrum.* 3 paraphyses and 3 spores from a specimen in herb. Persoon called „*Geoglossum laevipes*".

Fig. 53. *G. glabrum.* 2 paraphyses and 2 spores from Peck's type of *G. simile* collected at Sandlake, N. Y.

Fig. 54. *G. glabrum.* Ascus, 2 paraphyses and 2 spores from a specimen collected at Ithaca, N. Y.

Fig. 55. *G. glabrum.* Ascus, 2 paraphyses and 3 spores from a specimen of *G. sphagnophilum* in herb. Persoon, probably from Ehrenberg.

Fig. 56. *G. glabrum.* 6 paraphyses and 1 spore from specimen in Cooke, F. Brit. *n. 481* called *G. difforme.*

Fig. 57. *Geoglossum nigritum.* Ascus, 8 paraphyses and 5 spores from the type specimen in herb. Kew collected in Sweden.

Fig. 58. *G. nigritum.* Ascus, 4 paraphyses and 2 spores from portion of Saccardo's type of *G. glutinosum* var. *minus* collected in Italy.

Fig. 59. *G. nigritum.* 2 paraphyses and 4 spores from specimen in herb. N. Y. Bot. Garden, collected at Newfield, N. J.

Fig. 60. *Geoglossum pygmaeum.* Ascus, 4 paraphyses and 2 spores from the type specimen in herb. N. Y. State Museum collected at Poughkeepsie, N. Y.

Fig. 61. *Geoglossum fallax.* Ascus, 3 paraphyses and 3 spores from type specimen collected at Ithaca, N. Y.

Fig. 62. *G. fallax.* 3 paraphyses and 3 spores from specimen collected at Ithaca, N. Y.

Fig. 63. *G. fallax.* 3 paraphyses and 3 spores from specimen in Moug. and Nest. Stirp. Crypt. *n. 95.*

Fig. 64. *G. fallax.* Ascus, 6 paraphyses and 5 spores from specimen in herb. Lloyd collected in Sweden.

Fig. 65. *Geoglossum cohaerens.* 2 asci, 9 paraphyses and 7 spores from the type specimen in herb. N. Y. Bot. Garden collected at Newfield, N. J.

Fig. 66. *Geoglossum intermedium.* Ascus, 5 paraphyses and 6 spores from the type specimen collected at Knoxboro, N. Y.

Fig. 67. *G. intermedium.* Ascus, 5 paraphyses and 4 spores from specimen collected at Guelph, Ontario.

Fig. 68. *Geoglossum alveolatum.* Ascus, 2 paraphyses and 4 spores from specimen collected at Ithaca, N. Y.

Fig. 69. *G. alveolatum.* 2 paraphyses and 4 spores from the type specimen collected at Canandaigua, N. Y.

Fig. 70. *Gloeoglossum glutinosum.* 2 paraphyses and 4 spores from specimen collected at Ithaca, N. Y.

Fig. 71. *G. glutinosum.* Ascus, 4 paraphyses and 3 spores from specimen in herb. Persoon called *Geoglossum lubricum.*

Fig. 72. *G. glutinosum.* Ascus, 7 paraphyses and 4 spores from the type specimen in herb. Persoon.

Fig. 73. *Gloeoglossum affine.* Ascus, 3 paraphyses and 2 spores from the type specimen collected at Knoxboro, N. Y.

Fig. 74. *G. affine.* 4 paraphyses and 5 spores from specimen collected at Willsboro Pt., N. Y.

Fig. 75. *Gloeoglossum difforme.* Ascus, 3 paraphyses and 2 spores from specimen collected at Ithaca, N. Y.

Fig. 76. *G. difforme.* 2 asci, paraphysis and 4 spores from specimen in herb. Elias Fries collected in Sweden.

Fig. 77. *G. difforme.* 4 spores from a specimen of the original collection of *G. Peckianum* collected at Forestburg, N. Y.

Fig. 78. *Trichoglossum hirsutum.* Ascus, paraphysis and 5 spores from the type specimen in herb. Persoon.

Fig. 79. *T. hirsutum.* Ascus, 7 paraphyses, 3 spores and cystidium from a specimen collected at Intervale, N. Hampshire.

Fig. 80. *T. hirsutum.* Ascus, cystidium, 3 paraphyses and 2 spores from specimen in E. and E. F. Col. *n. 1729,* collected at Ithaca, N. Y.

Fig. 81. *T. hirsutum.* 3 spores from specimen in herb. Massee, N. Y. Bot. Garden, collected at Winton, New Zealand, called f. *leotioides.*

Fig. 82. *T. hirsutum.* 3 spores from specimen in herb. Elias Fries, collected at Winton, New Zealand, called *G. leotioides.*

Fig. 83. *Trichoglossum hirsutum* forma *Wrightii.* Ascus, cystidium, 4 paraphyses and 12 spores from the type specimen in herb. Curtis, at Harvard, collected in Cuba, *n. 387.*

Fig. 84. *T. hirsutum* forma *variabile.* Paraphysis and 4 spores from the specimen collected at Blowing Rock, N. Car.

Fig. 85. *T. hirsutum* forma *variabile.* Paraphysis and 6 spores from the specimen collected at Knoxboro, N. Y.

Fig. 86. *Trichoglossum velutipes.* Ascus, cystidium and 2 spores from a specimen collected at Ithaca, N. Y.

Fig. 87. *T. velutipes.* Ascus, cystidium and 6 spores from the type specimen in herb. N. Y. State Museum, collected at Northville, N. Y.

Fig. 88. *T. velutipes.* Ascus and 5 spores from the type of *T. hirsutum* var. *americanum* collected at Poughkeepsie, N. Y., now in herb. Kew.

Fig. 89. *Trichoglossum Farlowi.* Ascus, cystidium and 7 spores from the type specimen in herb. Kew, collected at Newton, Mass.

Fig. 90. *T. Farlowi.* Ascus, cystidium, 2 paraphyses and 9 spores from specimen collected at Wellesley, Mass.

Fig. 91. *T. Farlowi.* Ascus and 3 spores from specimen called *G. velutipes*, in herb. N. Y. Bot. Garden, collected at Oneida, N. Y.

Fig. 92. *T. Farlowi.* 3 spores as in last but in herb. N. Y. State Museum.

Fig. 93. *Trichoglossum Rehmianum.* Ascus, cystidium, 3 paraphyses and 11 spores from specimen collected at Blowing Rock, N. Car.

Fig. 94. *Trichoglossum Walteri.* 3 spores from specimen collected at Taylor's Falls, Minn.

Fig. 95. *T. Walteri.* 2 asci, 2 cystidia, 2 paraphyses and 5 spores from specimen collected at Willsboro Pt., N. Y.

Fig. 96. *T. Walteri.* Ascus, cystidium, 5 paraphyses and 7 spores from specimen collected at Malloryville, N. Y.

Fig. 97. *T. Walteri.* 3 paraphyses and 16 spores from the type specimen in herb. Kew, collected at Apollo Bay, Australia.

Fig. 98. *Spathularia clavata.* 2 asci, paraphysis and 2 spores from Moug. and Nest. Stirp. Crypt. *n. 1477.*

Fig. 99. *S. clavata.* 2 asci, paraphysis and 3 spores from specimen collected at Ithaca, N. Y.

Fig. 100. *S. clavata.* 2 asci, paraphysis and 8 spores from a portion of the original collection of *Mitruliopsis flavida* Pk., from Idaho.

Fig. 101. *Spathularia velutipes.* 3 asci, 2 paraphyses and 6 spores from specimen collected at Shelburne, N. H. by Dr. Farlow.

Fig. 102. *S. velutipes.* 3 spores from specimen collected in Vermont by E. A. Burt.

Fig. 103. *Cudonia circinans.* Ascus, paraphysis and 3 spores from type specimen in herb. Persoon.

Fig. 104. *Cudonia ochroleuca.* 2 asci and 3 spores from a portion of the original collection made in California by Harkness.

Fig. 105. *Cudonia lutea.* Ascus, paraphysis and 2 spores from specimen collected at Floodwood, N. Y. by C. H. Peck.

Fig 106. *Leotia lubrica.* 7 spores from specimen collected near Ithaca, N. Y.

Fig. 107. *L. lubrica* forma *Lloydii.* Ascus with spores from specimen collected at Glen Lake, Mich,. by C. G. Lloyd and named *Leotia chlorocephala* var. *Lloydii* by Dr. Rehm.

Fig. 108. *Leotia lubrica* forma *Stevensoni.* Ascus and 5 spores from the type specimen collected at Glamis, Scotland, *n. 992,* in herb. Kew, called *Leotia Stevensoni* Berk.

Fig. 109. *Leotia stipitata.* Ascus, 2 paraphyses and 3 spores from specimen collected near Ithaca, N. Y.

Fig. 110. *Leotia chlorocephala.* Ascus, paraphysis and 3 spores from specimen in herb. Schweinitz collected at Salem, N. Car.

Fig. 111. *Vibrissea truncorum.* Ascus, 2 paraphyses and spore from specimen in Moug. and Nest. Stirp. Crypt. *n. 781,* named *Leotia clavus* by Persoon.

Fig. 112. *V. truncorum.* Ascus, paraphysis and spore from specimen collected at Yukatat Bay, Alaska by W. Trelease.

Fig. 113. *Vibrissea foliorum.* Ascus, paraphysis and 2 spores from type specimen collected at West Haven, Conn. by R. Thaxter.

Fig. 114. *Apostemidium fiscellum.* Ascus and spore from Karsten, Fung. Fenn. *n. 764* collected in Finland.

Fig. 115. *Apostemidium Guernisaci.* Ascus, paraphysis and spore from specimen collected at Montmorency, France, by E. Boudier.

Fig. 116. *A. Guernisaci.* Ascus and spore from specimen in Phil. Elv. Brit. *n. 143,* collected in England.

Fig. 117. *A. Guernisaci.* Ascus, 2 paraphyses and spore from specimen collected at York, Me., by R. Thaxter.

Fig. 118. *A. Guernisaci.* Ascus, paraphysis and spore from specimen in E. and E., N. A. F. *n. 2738,* named *Gorgoniceps turbinulata* by Dr. Rehm.

Fig. 119. *Apostemidium vibrisseoides.* Ascus, 2 paraphyses and spore from the type specimen collected at Sandlake, N. Y., by Dr. Peck.

Fig. 120. *A. vibrisseoides.* 2 paraphyses from specimen collected at Shelburne, N. Hamp.

Fig. 121. *Geoglossum glabrum.* Group of plants collected at Ithaca, N. Y. Natural size.

Fig. 122. *G. glabrum.* 8 spores from a single ascus. From Ithaca, N. Y.

Fig. 123. *G. glabrum.* Portion of hymenium. Specimen from Ithaca, N. Y.
Fig. 124—126. *G. glabrum.* Spores from the type in herb. Persoon.
Fig. 127. *G. glabrum.* 4 spores from specimen in herb. Persoon called *G. glabrum* var. α.
Fig. 128. *G. glabrum.* 8 spores in ascus from specimen in herb. Persoon called *G. sphagnophilum*, probably from Ehrenberg.
Fig. 129. *G. glabrum.* 3 spores from specimen in herb. Persoon called *Geoglossum laevipes* Pers.
Fig. 130. *Geoglossum nigritum.* 8 spores from single ascus, from specimen in herb. Kew, collected at Upsala, Sweden by E. P. Fries, called *Clavaria nigrita.*
Fig. 131—132. *G. nigritum.* Portion of hymenium and 8 spores from a single ascus, from a specimen collected at Ithaca, N. Y.
Fig. 133. *Geoglossum fallax.* Group of plants collected at Ithaca, N. Y. Natural size. Type.
Fig. 134. *G. fallax.* 4 spores from a specimen collected at Ithaca, N. Y.
Fig. 135—136. *G. fallax.* Portion of hymenium and ascus with spores from a specimen collected in Sweden by C. G. Lloyd.
Fig. 137. *G. fallax.* Ascus with spores from specimen collected at Ithaca, N. Y.
Fig. 138—139. *Geoglossum cohaerens.* Asci with spores from type specimens collected at Newfield, N. J. by J. B. Ellis, Nov. 6, 1889 and Dec. 1, 1889, both from the same spot.
Fig. 140—141. *Geoglossum pygmaeum.* Portion of the hymenium and 3 spores from the type specimen collected at Poughkeepsie, N. Y. by Gerard.
Fig. 142—144. *Geoglossum intermedium.* Portion of hymenium, ascus with spores and single spore from a specimen collected at Knoxboro, N. Y., by H. S. Jackson.
Fig. 145. *Geoglossum alveolatum.* Group of plants collected at Freeville, N. Y., by H. S. Jackson. Natural size.
Fig. 146—147. *G. alveolatum.* Single spore and portion of the hymenium from type specimen *(n. 1686)*, collected at Canandaigua, N. Y.
Fig. 148. *G. alveolatum.* Portion of hymenium from specimen collected at Ithaca, N. Y.
Fig. 149. *Gloeoglossum glutinosum.* Group of plants from Ithaca, N. Y. Natural size.
Fig. 150. Transection of the stem near the base of one of the plants shown in fig. 149, showing the ectal layer of paraphyses.
Fig. 151. 3 spores and tips of 2 paraphyses from the same plant as last.
Fig. 152. *Gl. glutinosum.* Group of paraphyses from specimen collected at Ithaca, N. Y.
Fig. 153. *Gl. glutinosum.* Ascus with spores from specimen collected at Canandaigua, N. Y.

Fig. 154. *Gl. glutinosum.* Ascus with spores from the type specimen in herb. Persoon.

Fig. 155. *Gl. glutinosum.* Ascus with spores from specimen in herb. Persoon, called *G. lubricum*, collected by Mougeot.

Fig. 156. *Gloeoglossum difforme.* Group of plants collected at Ithaca, N. Y. Natural size.

Fig. 157—158. *Gl. difforme.* Ascus with spores and 8 spores from a single ascus, from same plants as fig. 156.

Fig. 159. *Gl. difforme.* Portion of hymenium showing coiled paraphysis from specimen collected at Ithaca, N. Y.

Fig. 160. *Gl. difforme.* Transection of stem near the base showing the ectal layer of paraphyses. Compare figs. 150 and 161.

Fig. 161. *Geoglossum glabrum.* Transection of stem near the base showing the absence of ectal layer of paraphyses. Fig. 150, 160 and 161 were photographed with low magnification.

Fig. 162. *Gl. difforme.* Portion of the ectal layer shown in fig. 160 more highly magnified showing the presence of an ascus with spores near the base of the stem.

Fig. 163. *Gl. difforme.* Ascus with spores from specimen collected at Sandlake, N. Y., by C. H. Peck.

Fig. 164. *Gl. difforme.* Ascus with spores from specimen in herb. Elias Fries, collected in Småland, Sweden, and labeled *Geoglossum difforme* in his own handwriting.

Fig. 165—167. *Gloeoglossum affine.* 2 portions of the hymenium and 4 spores from the type collected at Knoxboro, N. Y., by H. S. Jackson.

Fig. 168. *Trichoglossum Rehmianum.* Ascus with 8 spores from specimen collected at Blowing Rock, N. Car.

Fig. 169. *Trichoglossum velutipes.* Group of plants collected at Ithaca, N. Y. Natural size.

Fig. 170—171. *Tr. velutipes.* Portion of hymenium and ascus with 4 spores from specimen collected at Blowing Rock, N. Car.

Fig. 172. *Tr. velutipes.* Ascus with 4 spores from the type of *G. hirsutum* var. *americanum* in herb. Kew, collected at Poughkeepsie, N. Y., by W. R. Gerard, *n. 53.*

Fig. 173. *Tr. velutipes.* Ascus with 4 spores from the type specimen collected at Northville, N. Y., by C. H. Peck.

Fig. 174. *Tr. hirsutum* forma *Wrightii.* Ascus with 8 spores from specimen in the Curtis herb., Harvard Univ., collected in Cuba, by Wright *(n. 387).*

Fig. 175. Ascus with 8 spores of *Geoglossum hirsutum* var. *leotioides* from specimen collected at Winton, New Zealand, by Berggren.

Fig. 176. *Trichoglossum hirsutum.* Ascus with 8 spores from the type of *Geoglossum hirsutum* in herb. Persoon.

Fig. 177. 2 spores from the same specimen as fig. 176.

Fig. 178. *Tr. hirsutum.* 6 spores from the same ascus from specimen collected in Minnesota.

Fig. 179. *Tr. hirsutum.* 7 spores from the same ascus from specimen collected at Upsala, Sweden, in herb. Fries.

Fig. 180. *Tr. hirsutum.* Ascus with spores from specimen collected at Intervale, N. Hamp., by R. Thaxter.

Fig. 181. Portion of hymenium from same collection.

Fig. 182—183. *Tr. hirsutum* forma *variabile.* 3 spores and ascus with 8 spores from specimen collected at Blowing Rock, N. Car.

Fig. 184. *Tr. hirsutum* forma *variabile.* 8 spores from a single ascus from specimen collected at Knoxboro, N. Y., by H. S. Jackson.

Fig. 185. *Mitrula phalloides.* Group of plants collected at Ithaca, N. Y. Natural size.

Fig. 186. *Trichoglossum Farlowi.* Portion of hymenium from specimen in E. & E. N. A. F. *n. 3532.*

Fig. 187. *Tr. Farlowi.* 2 asci with spores from specimen collected at Wellesley, Mass., by Dr. M. C. Ferguson.

Fig. 188. *Tr. Farlowi.* Asci and spores from specimen collected at Newton, Mass., by Dr. Farlow.

Fig. 189. *Tr. Farlowi.* Ascus with 8 spores from the type specimen in herb. Kew. collected at Newton, Mass., by Dr. Farlow.

Fig. 190. *Trichoglossum Walteri.* Single spore from the type specimen in herb. Kew, from Apollo Bay, Australia.

Fig. 191. *Tr. Walteri.* 4 spores from plant collected in Mass.

Fig. 192. *Tr. Walteri.* Portion of hymenium from plants collected at Intervale, N. Hamp., by R. Thaxter.

Fig. 193. *Tr. Walteri.* Ascus and spores from plants collected at Chestnut Hills, Mass., by R. Thaxter.

Fig. 194. *Corynetes arenarius.* Portion of hymenium of *Microglossum arenarium* from the type specimen collected in Greenland.

Fig. 195. *C. arenarius.* A spore from specimen collected in Denmark, by Rostrup.

Fig. 196—197. *C. arenarius.* Ascus with spores and single spore from specimen of *Leptoglossum latum* Peck, collected in Labrador by Waghorne.

Fig. 198. *Corynetes robustus.* Group of plants collected at Ithaca, N. Y. Natural size.

Fig. 199—202. *C. robustus.* Portion of hymenium, ascus with spores, paraphyses and group of spores from specimens collected at Blowing Rock, N. Car.

Fig. 203. *Microglossum fumosum.* Group of plants collected at Ithaca, N. Y. Natural size.

Fig. 204—205. *M. fumosum.* Ascus with spores and single spore from specimen collected at Sandlake, N. Y., by C. H. Peck, and labeled *Leptoglossum fumosum* Pk.

Fig. 206. *Microglossum longisporum.* Group of plants of the type collected at Ithaca, N. Y., by Long and Durand.

Fig. 206a. Single long spore from the same collection,

Fig. 207. *Microglossum rufum.* Group of plants collected at Ithaca, N. Y. Natural size.

Fig. 208. *Microglossum viride.* Group of plants collected at Ithaca, N. Y. Natural size.

Fig. 209. *Microglossum olivaceum.* Group of plants collected at Ithaca, N. Y., by W. H. Long. Natural size.

Fig. 210. *Leotia stipitata.* Group of plants collected at Ithaca, N. Y. Natural size.

Fig. 211. *Leotia chlorocephala.* Group of plants collected at Blowing Rock, N. Car. Natural size.

Fig. 212. *L. chlorocephala.* Group of plants collected at Ithaca, N. Y.

Fig. 213. *Leotia lubrica.* Group of plants from Ithaca, N. Y. Natural size.

Fig. 214. *Cudonia circinans.* An arc of a circle or fairy ring collected and photographed by Prof. G. F. Atkinson, in a spruce forest, at Pontarlier, France, 1905.

Fig. 215. A group of the same plants natural size.

Fig. 216. *Cudonia lutea.* Group of plants from Ithaca, N. Y. Natural size.

Fig. 217—218. *C. lutea.* 2 spores and ascus with spores from material collected at Ithaca, N. Y.

Fig. 219. *C. lutea.* A group of young plants, x2, showing fragments of the veil or membrane covering the hymenium, just breaking away. From material collected at Ithaca, N, Y.

Fig. 220. *Spathularia clavata.* Group of plants from Ithaca, N. Y. Natural size.

Fig. 221. *Spathularia velutipes.* Group of plants from Ithaca, N. Y. Natural size.

Fig. 222. *S. velutipes.* Group of 8 young plants, x2, showing steps in the cracking and fragmentation of the veil. From material collected at Ithaca, N. Y.

Sydow, Mycotheca germanica Fasc. XIV—XV (No. 651—750).

An der Herausgabe der beiden im November 1908 erschienenen Faszikel beteiligten sich die Herren H. Diedicke, G. Feurich, O. Jaap, W. Krieger, R. Lauche, G. Lindau, W. Mönkemeyer, G. Oertel, Rakete, A. Schade, V. Torka und P. Vogel. Die Faszikel enthalten:

651. Craterellus cornucopioides (L.) Pers.
652. Polystictus abietinus Fr.
653. Radulum orbiculare Fr.
654. Odontia alutacea Fr.
655. Hydnum cyathiforme Schaeff.
656. Puccinia Acetosae (Schum.).
657. P. Cyani (Schleich.) Pass.
658. P. fusca (Pers.) Wint.
659. P. Petroselini (DC.) Lindr.
660. P. Picridis Hazsl.
661. P. Porri (Sow.) Wint.
662. P. Saniculae Grev.
663. Gymnosporangium Sabinae (Dicks.) Wint.
664. Schroeteriaster alpinus (Schroet.) P. Magn.
665. Cronartium ribicola Dietr.
666. Coleosporium Cacaliae (DC.).
667. C. Senecionis (Pers.) Fr.
668. Ustilago echinata Schroet.
669. U. intermedia Schroet.
670. U. major Schroet.
671. Thecaphora hyalina Fingerh.
672. Peronospora Oerteliana Kuehn.
673. P. parasitica (Pers.) De By.
674. Plasmopara pusilla (De By.) Schroet.
675. Physoderma Gerhardti Schroet.
676. — — forma minor Krieg.
677. Sphaerella Iridis Awd.
678. Sph. latebrosa Cke.
679. Sph. Populi Awd.
680. Sph. rhoina Sacc. n. sp.
681. Sph. Vogelii Syd. n. sp.
682. Stigmatea Rumicis (Desm.) Schroet.
683. Venturia Alchemillae (Grev.) B. et Br.
684. Gnomonia euphorbiacea Sacc. et Br.
685. Pyrenophora comata (Awd. et Niessl) Sacc.
686. Cryptosphaeria populina (Pers.) Sacc.
687. Eutypa sparsa Rom.
688. Chorostate Sydowiana Sacc. n. sp.
689. Melanconis stilbostoma (Fr.) Tul.
690. Gibberidea turfosa Syd. n. sp.
691. Cucurbitaria elongata (Fr.) Grev.
692. Dothidella betulina (Fr.) Sacc.
693. Hypocrea gelatinosa (Tode) Fr.
694. Nectria sanguinea (Sibth.) Fr.
695. Polystigma ochraceum (Wahl.) Sacc.
696. Claviceps microcephala (Wallr.) Tul.
697. Morchella esculenta (L.) Pers. var. rotunda Pers.

698. Humaria granulosella Rehm n. sp.
699. H. rutilans (Fr.) Sacc.
700. H. subhirsuta (Schum.) Karst.
701. Helotium epiphyllum (Pers.) Fr.
702. Lachnum Nardi Rehm.
703. Mollisia atrata (Pers.) Karst.
704. Trichobelonium distinguendum Syd. n. sp.
705. Pyrenopeziza Lychnidis (Sacc.) Rehm.
706. Stictis fimbriata Schw.
707. Coniocybe furfuracea (L.) Koerb.
708. Phyllosticta Alismatis Sacc. et Speg.
709. Ph. corcontica Kabát et Bubák.
710. Phoma frigida Sacc. n. sp.
711. Phomopsis protracta Sacc.
712. Aposphaeria pinea Sacc.
713. Asteroma Bupleuri Sacc. et Roum.
714. Vermicularia samaricola Sacc.
715. Sphaeronaema Senecionis Syd.
716. Dothiorella advena Sacc.
717. Cytospora querna Sacc. n. sp.
718. Cytodiplospora Rhois Sacc.
719. Darluca hypocreoides Fuck.
720. Diplodia platanicola Sacc. n. sp.
721. Septoria Bupleuri-falcati Died.
722. S. Senecionis West.
723. Phlyctaena Magnusiana (Allesch.) Bres.
724. Pirostoma circinans Fr.
725. Dothichiza exigua Sacc. n. sp.
726. Discella populina Sacc. n. sp.
727. Gloeosporium cinerescens Bubák.
728. G. Myrtilli Allesch.
729. G. Tremulae (Lib.) Pass.
730. G. Vogelianum Sacc. n. sp.
731. Monosporium agaricinum Bon.
732. Ovularia minutissima Syd. n. sp.
733. Ramularia Armoraciae Fuck.
734. R. Atropae Allesch.
735. R. Coleosporii Sacc.
736. R. evanida (Kühn) Sacc.
737. R. lamiicola Massal.
738. R. Lysimachiae Thuem.
739—740. R. Phyteumatis Sacc. et Wint.
741. R. Picridis Fautr. et Roum.
742. R. silvestris Sacc.
743. Bostrichonema alpestre Ces.
744. Hadrotrichum Phragmitis Fuck.
745. H. virescens Sacc. et Roum.
746. Cercospora Chenopodii Fr.
747—748. Fusicladium depressum (B. et Br.) Sacc.
749. Dendryphium penicillatum (Cda.) Fr.
750. Tuberculina microstigma Sacc. n. sp.

677. **Sphaerella Iridis** Awd.

Wir entwerfen von diesem Pilze, dessen Beschreibungen in den Werken von Saccardo, Winter und Schroeter nicht übereinstimmen, folgende Diagnose.

Maculis amphigenis, oblongis, 2—8 mm longis, griseolis; peritheciis amphigenis, gregariis, immersis, epidermide primo tectis, globosis vel depresso-globosis, atris, membranaceis, 60—110 μ diam., poro minuto pertusis; ascis late ellipsoideis vel saccatis, apice plerumque rotundatis, basi saepius attenuatis, subsessilibus, 35—45 ⩽ 17—20 μ, octosporis; sporidiis subtristichis, oblongis, utrinque rotundatis, circa medium septatis et plus minusve constrictis, 15—18 ⩽ 4—6 μ, hyalinis.

681. **Sphaerella Vogelii** Syd. nov. spec.

Peritheciis hypophyllis, dense sparsis vel gregariis, immersis, atris, membranaceis, subglobosis, 60—125 μ diam.; ascis fasciculatis, aparaphysatis, clavatis, sessilibus vel brevissime stipitatis, apice rotundatis, 42—50 ⩽ 9—11 μ, octosporis; sporidiis distichis, oblongo-fusoideis, circa medium septatis, subinde loculo superiore latiore sed breviore, tandem constrictis, hyalinis, 15—22 ⩽ 3—4½ μ.

Hab. in foliis putrescentibus Rhamni Catharticae, Tamsel, Marchia, 22. 5. 1908, leg. P. Vogel.

690. **Gibberidea turfosa** Syd. nov. spec.

Peritheciis plerumque caespitosis 2—5 dense congestis, raro tantum solitariis, primo peridermio tectis, dein erumpentibus, tandem subsuperficialibus, stromate non vel vix evoluto, globosis, carbonaceis, atris, ostiolo minuto papilliformi, 300—450 μ diam.; ascis longe cylindraceis, apice obtusis, breviter stipitatis, 85—115 ⩽ 7—9 μ, octosporis; paraphysibus numerosis, filiformibus, ascos superantibus; sporidiis monostichis, ovato-oblongis, utrinque obtusis, 3-septatis, ad septa lenissime constrictis, olivaceo-brunneis, 14—18 ⩽ 4½—7 μ.

Hab. in ramis emortuis Vaccinii uliginosi, Rotes Moor pr. Gersfeld, Rhöngebirge.

Der Pilz entspricht bezüglich der Fruchtschicht der unvollständigen Beschreibung von *Melanomma Lenarsii* (West.) Sacc. auf *Calluna vulgaris* in Belgien. Das Originalexemplar dieses Pilzes wurde uns freundlichst vom botanischen Garten in Brüssel zur Verfügung gestellt und ergab die Untersuchung, daß hier keine *Gibberidea*, sondern eine *Melanomma* vorliegt, da die Perithezien nicht rasig gehäuft, sondern zerstreut, oft einzeln stehen. Asci konnten wir nicht auffinden, da die Originalprobe sehr spärlich und teils schon überreif ist. Die Sporen der *Melanomma* messen 12—17 ⩽ 3½—5 μ und gleichen sehr denjenigen unseres neuen Pilzes.

704. **Trichobelonium distinguendum** Syd. nov. spec.

Ascomatibus gregariis, mycelio ex hyphis brunneolis septatis ca. 5 μ crassis composito insidentibus, tenuiter marginatis, disco plano albido-griseo vel leniter albido-coerulescente, extus subhyalinis, levibus, ½—2 mm latis, ceraceis, in sicco vix vel parum involutis et sordide albidis vel albo-griseis; ascis cylindraceo-clavatis, apice obtuse attenuatis, 60—80 ⩽ 6—8 μ, octosporis; sporidiis distichis, subcylindraceis, obtusis, rectis vel lenissime curvulis, primo continuis et pluribus guttulis oleosis repletis, dein medio 1-septatis (an tandem pluriseptatis?), hyalinis, 18—26 ⩽ 2½—3½ μ; paraphysibus filiformibus, hyalinis, ca. 1½ μ latis, ascos aequantibus vel parum superantibus.

Hab. in culmis emortuis Phragmitis communis, Schmöckwitz pr. Berolinum Marchiae, 8. 1908, leg. Sydow.

Die Art gleicht habituell sehr der *Tapesia hydrophila* (Karst.) Rehm, von welcher sie sich jedoch durch andere Sporen unterscheidet. Sie erinnert in dieser Beziehung an *Trichobelonium retincolum* (Rabh.) Rehm, welches jedoch ganz andere Apothezien besitzt. Die neue Art steht demnach auffallend in der Mitte zwischen den beiden genannten, ebenfalls an *Phragmites* vorkommenden Spezies.

732. **Ovularia minutissima** Syd. nov. spec.

Maculis amphigenis, orbicularibus vel ellipticis, ca. 3—6 mm longis, brunneolis, plerumque purpureo-marginatis; caespitulis hypophyllis, plus minus dense aggregatis, minutissimis, oculo nudo haud vel vix perspicuis, albidis; hyphis fasciculatis, non septatis, hyalinis, 20—40 ⩻ 2—4 μ, apicem versus torulosis denticulisque paucis praeditis; conidiis oblongo-ovoideis, utrinque rotundatis, continuis, hyalinis, 7—10 ⩻ 3—5 μ.

Hab. in foliis Hyperici quadranguli, Riesengebirge, Weißwassergrund, 1. 9. 1908.

Eine sehr winzige und, wie es scheint, leicht vergängliche Art.

* * *

Die Diagnosen der neuen von Herrn Professor P. A. Saccardo aufgestellten Arten werden in Kürze ebenfalls in dieser Zeitschrift veröffentlicht werden.

Novae fungorum species — V.[1])

Auctoribus H. et P. Sydow.

Uromyces elatus Syd. nov. spec.

Pycnidiis epiphyllis, minutis, flavo-brunneis; aecidiis hypophyllis, maculis minutis orbicularibus flavidis vel obsoletis insidentibus, sparsis, solitariis vel raro binis trinis aggregatis, diu omnino clausis et hemisphaericis, tandem applanatis et poro rotundo apertis, $^1/_2$—1 mm latis, flavis; contextu e cellulis angulato-globosis magnis laxe coalitis hyalino-flavidis verrucosis 45—70 μ diam. composito; aecidiosporis globosis, subglobosis vel ellipsoideis, verruculosis, hyalino-flavidis, 28—38 μ diam., episporio ca. $3^1/_2$ μ crasso; soris teleutosporiferis hypophyllis, maculis orbicularibus flavidis saepe insidentibus, minutis, sed in greges rotundatos vel irregulares usque $1^1/_2$ cm longos dense dispositis, compactis, flavo-brunneolis; teleutosporis oblongis vel oblongo-cylindraceis, apice rotundatis, non incrassatis, basi attenuatis vel etiam rotundatis, levibus, hyalino-flavidis, 40—68 ⩻ 17—21; pedicello crasso, firmo, hyalino, sporam circiter aequante.

Hab. in foliis vivis Lupini ramosissimi, La Paz Boliviae, 19. 8. 1906, 3700 m s. m. (O. Buchtien).

Puccinia concolor Syd. nov. spec.

Soris teleutosporiferis hypophyllis, maculis orbicularibus brunneis 2—8 mm diam. insidentibus, minutis, sed in pulvinulum crassiusculum rotundatum 1—4 mm latum plerumque omnino confluentibus, compactis, brunneis; teleutosporis oblongis vel clavatis, apice rotundatis vel acutiusculis incrassatis (usque 9 μ), medio constrictis, levibus, dilute flavo-brunneolis, 35—55 ⩻ 14—18 μ; pedicello persistenti, flavo-brunneolo, crasso, usque 40 μ longo; mesosporis saepe immixtis.

Hab. in foliis Lepistemonis owariensis in Africa orient. german., leg. A. Karasek.

Puccinia distinguenda Syd. nov. spec.

Soris teleutosporiferis amphigenis vel saepe petiolicolis, sparsis vel etiam aggregatis, mediocribus, rotundatis vel ad nervos et petiolos elongatis ibique confluendo 1—5 mm longis, epidermide rupta cinctis, pulverulentis, atris; uredosporis immixtis globosis, subglobosis vel ellipsoideis, subtiliter

[1]) Cfr. Annal. Mycol. V, p. 338.

echinulatis, flavis, 21—26 ⩽ 17—23, poris germinationis tribus praeditis, episporio ca. $1^1/_2$ μ crasso; teleutosporis ovato-ellipsoideis, ellipsoideis vel oblongis, utrinque rotundatis, apice non incrassatis, medio non vel leniter constrictis, distincte et grosse reticulatis, obscure brunneis, 28—38 ⩽ 18—26, episporio $3^1/_2$—$4^1/_2$ μ crasso; pedicello sporam subaequante, sed deciduo, hyalino subinde oblique inserto.

Hab. in foliis petiolisque Chaerophylli macropodi Boiss. pluribus locis in Persia bor. (Bornmüller no. 5751, 5716, 5752).

Die Art unterscheidet sich von den übrigen auf *Chaerophyllum* vorkommenden verwandten Spezies durch die sehr stark retikulierten, dunklen und mit sehr dicker Membran versehenen Teleutosporen, auch habituell durch größere dunklere Lager. In letzterer Hinsicht erinnert sie täuschend an die auf gleicher Nährpflanze ebenfalls in Persien vorkommende *Pucc. chaerophyllina* Syd., welche sich jedoch in den Sporen von unserer neuen Art weit unterscheidet.

Rosellinia Victoriae Syd. nov. spec.

Subiculo albo late effuso, tandem sordide albo et plus vel minus evanescente; peritheciis plerumque dense gregariis confertisque, primo subiculo immersis, dein erumpentibus et subliberis, late globoso-conicis, levibus, atris, opacis, carbonaceis, papillatis, circa papillam saepe albis, 300—600 μ diam.; ascis anguste cylindraceis, longe pedicellatis, 60—80 ⩽ 5—7 μ, octosporis; sporidiis monostichis, fusoideis, inaequilateris, continuis, obscure brunneis, 9—11 ⩽ 5—6 μ.

Hab. ad truncos ecorticatos, County of Follett, Victoria, 16. 6. 1907, leg. F. M. Reader.

Die Perithezien brechen aus einer ausgebreiteten weißlichen, später mehr oder weniger verschwindenden Unterlage hervor und stehen zuletzt fast frei. Die kohlschwarzen Perithezien sind besonders in der Jugend rings um die Papille mit einer weißen Zone versehen, welche aus den Überresten der weißen Unterlage besteht, die bei dem Durchbruch an der Spitze haften geblieben sind. Mit dem Alter verschwindet diese weiße Zone.

Mollisia allantoidea Syd. nov. spec.

Apotheciis gregariis, rarius solitariis, late sessilibus, hinc inde confluentibus, disco plano tenuiter marginato, flavo-brunneis vel demum brunneis, levibus, 0,3—0,8 mm diam., ceraceis; ascis clavato-cylindraceis, apice rotundatis, 18—25 ⩽ 3 μ, octosporis, breviter stipitatis; sporidiis distichis, allantoideis, plerumque leniter curvulis, hyalinis, continuis, $3^1/_2$—5 ⩽ 1 μ; paraphysibus paucis, filiformibus, hyalinis.

Hab. in caulibus Tanaceti vulgaris, Tamsel pr. Cüstrin, Marchia, 14. 10. 1907, leg. P. Vogel.

Die prächtig entwickelte Art ist von allen bekannten Spezies der Gattung durch die Kleinheit der Schläuche und Sporen verschieden.

Phyllosticta Galeobdoli Syd. nov. spec.

Maculis irregularibus, distinctis, 2—10 mm longis, albidis, brunneo- vel atropurpureo-marginatis; pycnidiis epiphyllis, sparsis, globosis, atrobrunneis, 130—200 μ diam.; sporulis oblongis, continuis, hyalinis, utrinque rotundatis, utrinque 1-guttulatis, 4—5 ⩽ 1—$1^1/_2$ μ.

Hab. in foliis Galeobdoli lutei, Rotstein pr. Sohland Saxoniae, 24. 9. 1904, leg. A. Schade.

Phyllosticta Garrettii Syd. nov. spec.

Maculis amphigenis, orbicularibus, usque 1 cm diam., flavidis, medio dein arescentibus; pycnidiis amphigenis, punctiformibus, gregariis, nitidis, globosis, 60—100 μ diam., poro rotundo lato pertusis; sporulis cylindraceis, continuis, eguttulatis, 3—4 ⩽ 1 μ.

Hab. in foliis Senecionis disparis, Big Cottonwood Canyon, Utah Americae bor., 10. 7. 1908, leg. A. O. Garrett.

Readeriella Syd. nov. gen. Sphaeropsidearum (Etym. a cl. F. M. Reader, fungi detectore).

Stromata minuta, phyllachoroidea, epidermide tecta, atra, intus minute plurilocularia; sporulae ambitu trigonae, continuae, fuscae.

Readeriella mirabilis Syd. nov. spec.

Stromatibus amphigenis, maculis orbicularibus $^1/_2$—1 cm diam. obscure brunneis insidentibus, in circulos amoene formatos et concentrice ordinatos dispositis, minutis, ca. $^1/_4$—$^1/_3$ mm diam., intus minute plurilocularibus, atris, epidermide elevata diu (vel semper?) tectis, phyllachoroideis; sporulis ambitu trigonis, continuis, fuscis, 9—11 μ diam.

Hab. in foliis Eucalypti capitellatae, County of Follett, Victoria, 16. 6. 1907, leg. Reader.

Die neue Gattung ist durch die eigentümliche dreieckige Form der Sporen sehr ausgezeichnet. Die Sporenlager sind genau ringförmig angeordnet. Mitunter enthält einer der großen Flecken nur einen Ring von Sporenlagern, während der ganze Innenraum frei ist. Meistens sind jedoch mehrere Ringe konzentrisch angeordnet.

Coniosporium limoniiforme Syd. nov. spec.

Acervulis amphigenis, minutissimis, subinde aggregatis et confluentibus, superficialibus, atris; conidiis limoniiformibus, continuis, levibus, atrobrunneis, 28—38 ⩽ 18—24 μ.

Hab. in foliis vivis Rosae spec. cultae, Salt Lake City, Utah Americae bor., 1. 10. 1908, leg. A. O. Garrett.

Die Art steht dem *C. nitidum* Karst. (cfr. Sacc. Syll. X, p. 569) der Beschreibung nach nahe.

Rehm: Ascomycetes exs. Fasc. 42.

Derselbe enthält nahezu allein brasilianische Ascomyceten, gesammelt von Dr. C. F. Baker, Ule (comm. Dr. Pazschke), Dr. Rick S. J., Noack (comm. Sydow), Dr. Möller (comm. Prof. Hennings), außerdem einen Discomyceten von Prof. Harper aus Nord-Amerika und zwei Arten aus N.-Österreich von P. Strasser O. S. B., endlich mehrere Ascomyceten von mir gesammelt. Der größte Dank gebührt den Einsendern, insbesondere Dr. Baker in Parà, für den reichen, seltenen Inhalt dieses Faszikels, wie er nicht leicht wieder geboten werden kann.

Neufriedenheim/München XII, 1. Oktober 1908.

Dr. Rehm.

1776. **Sarcoscypha floccosa** (Schwein.) Cooke.

Cfr. Cooke Mycogr. pl. 25 f. 97, Sacc. Syll. f. VIII p. 156, Durand Bull. Torr. bot. Club 27 p. 476.

Syn.: *Geopyxis floccosa* Morgan (Journ. Myc. VIII p. 188).

On *Tilia americana* decaying. Fullers Woods. Madison Wisc. U. St. A. 1903. R. A. et A. M. Harper.

1777. **Pezizella**? **dilutella** (Schröter) Rehm.

Syn.: ? *Hymenoscypha dilutella* Schröter (Schles. Cr. III 2 p. 70).

? *Hyalinia dilutella* Boudier (Discom. Europ. p. 104).

Cfr. Jaap, Verh. bot. Ver. Brandenburg 1907 p. 10.

(*Mollisia dilutella* Phill. (Man. brit. Disc. p. 190 pl. VI f. 34) ist offenbar ganz verschieden, da er ebenso wie Sacc. (Syll. VIII p. 277) als syn.: *Helotium xeroplasticum* Rehm Ascom. 365 anführt. Schröter führt als Autor bei *dilutella* Saccardo an, letzterer aber bringt unter *Pezizella dilutella* (Fr.) Fuckel (Symb. myc. p. 300) offenbar verschiedene Discomyceten.)

An einem faulenden Pflanzenstengel in einer Kiesgrube bei Hadern (München). 6/1907. Rehm.

(Die vorliegenden Exemplare haben ein zartes, glattes, gelblichweißes Gehäuse der —400 μ breiten, unten eng zusammengezogenen, weißlich-flaumig berandeten Apothezien. Der Rand wird gebildet von auseinandertretenden, am Ende 30—40 μ langen, 5 μ breiten, meist unregelmäßig gebogenen, stumpfen, rauhen, fast farblosen Zellreihen. Schläuche keulig, abgerundet, 35 ⩽ 5 μ, 8-sporig. J +. Sporen keulig, gerade, 1-zellig, farblos, 7—8 ⩽ 2 μ. Paraphysen fädig, 2 μ.)

1778. **Trichobelonium albo-succineum** Rehm (Hedwigia 1900 p. 89 tab. V f. 24).
Cfr. Sacc. Syll. XVI p. 747.
On *Cassia Hoffmannseggii*. Parà, Brasilien. 5/1908. C. F. Baker.
(Der Pilz sitzt auf dem Myzel einer Meliola.)

1779. **Lembosia Byrsonimae** P. Henn. (F. Amaz. II p. 265).
Cfr. Sacc. Syll. XVII p. 898.
On *Byrsonima lancifolia*. Parà, Brasilien. 4/1908. C. F. Baker.

1780. **Lembosia graphioides** Sacc. et Berl. var. **Sophorae** Rehm (Exs. Rabh.).
Cfr. Sacc. Syll. IX p. 1105.
Exs.: Rabenh. Pazschke f. eur. 4168.
In foliis *Sophorae*. São Francisco, Sta. Catharina, Brasilien. 7/1885. Ule, comm. Dr. Pazschke.
(Die Apothezien sind äußerst schwer sichtbar, erst deutlich am gut angefeuchteten Blatt. Die Var. weicht von der Beschreibung bei Sacc. ab durch eiförmige, dicke Schläuche, 30—33 ⩽ 18—20 μ, in der Mitte etwas eingeschnürte Sporen mit etwas schmälerer unterer Zelle, 15—18 ⩽ 5—7 μ und verklebte, 2 μ breite, oben etwas bräunliche Paraphysen. Das Gehäuse läuft am Grund in parallele, 3 μ breite, später meist gegenständig ästige Hyphen aus.)

1781. **Nectria Anacardii** P. Henn. n. sp.
An Rinde von *Anacardium occidentale*. Parà, Brasilien. 5/1908. Dr. Baker, comm. P. Hennings.

1782. **Sphaerostilbe Cordiae** Rehm n. sp.
Perithecia in mycelio epiphyllo orbiculari, arachnoideo, plus minusve conspicuo, albidulo 2—6 arcte congregata, sessilia, globulosa, poro vix conspicuo pertusa, glabra, carneo-rosea, sicca umbilicato-collapsa, 0,2—0,25 mm lat., ad basim hyphis brevibus, septatis, hyalinis, sparsis, 5—8 μ lat. obsessa, parenchymatice flave contexta, plerumque in consortio Stilbi, fungi conidiophori, erecti, cylindracei vel obovato-clavati, obtusi, saepe subfasciculati, albiduli, hirtelli, ad clavulam carneo-roseam ovatam 0,15—0,2 mm lat., —1,2 mm alti. Asci cylindracei tenerrimi, sessiles, c. 60 ⩽ 8 μ, 8-spori. Sporae oblongae, utrinque obtusae, medio septatae et valde constrictae, utraque cellula guttulis oleosis repleta, glabrae, hyalinae, 10—12 ⩽ 5—6 μ, 1- interdum 2-stichae. Paraphyses nullae. Conidia Stilbi singula in basidiis hyalinis 2,5 μ lat. sessilia, fusiformia, utrinque acutata, recta, 1-cellularia, 2-guttata, hyalina, 9—10 ⩽ 3 μ.
Ad folia *Cordiae umbraculiferae*. Parà, Brasilien. 1/1908. C. F. Baker.
(Stimmt zu keiner der beschriebenen Arten.)

1783. **Ophionectria cerea** (B. et C.) Ell. et Ev. (N. Am. Pyr. p. 118).
Syn.: *Sphaeria cerea* B. et C. (Grevillea IV p. 108) 1876!
Calonectria cerea Sacc. (Syll. II p. 551).

Auf dem Stroma von *Eutypa* unterrindig an faulenden Eichen-Ästchen am Sonntagberg, N.-Österreich. 1908. P. Strasser O. S. B. (Soll auch auf gleichem Stroma an Birken und Buchen vorkommen.)

(E. et Ev. l. c. „Perithecia dull, dirty yellow and granular pruinose except the rather acutely papilliform ostiola. Asci oblongo-cylindrical, 75—80 ⩒ 12—14 μ, sporae fusoid-cylindrical, yellowish hyaline, multiseptate, 35—50 ⩒ 3—3,5 μ, slightly tapering from the middle to the end. On old Diatrype stigma and bark of decaying oak-limbs."

Als syn. wird erachtet: *Ophionectria Everharti* Ell. et Gall. (Journ. Myc. 1890 p. 32) und *Dialonectria fulvida* E. et E. (Journ. Myc. II p. 136) = *Calonectria fulvida* Sacc. (Syll. IX p. 986).

Syn.: *Calonectria belonospora* Schröter (Schles. Cr. III 2 p. 261) 1894!

„Apothezien mit sehr kleiner warzenförmiger Mündung, später niedergedrückt, bräunlich- oder grünlichgelb, glatt, mit vielleicht zugehörigen braunen Hyphen. Schläuche zylindrisch-keulenförmig, 70—80 ⩒ 7—9 μ. Sporen lang spindelförmig, fast nadelförmig, mit spitzen Enden, 45—50 ⩒ 3 μ, 8—10-zellig. Auf Fruchtlagern von Diatrype Stigma. Vielleicht syn.: *Sphaeria cerea* B. et C.?"

Syn.: *Ophionectria Briardi* Boud. (Rev. myc. 1885! p. 226 tab. LVI f. 2). Cfr. Sacc. Syll. IX p. 995.

„Perithecia aureo-puberula, ostiolo applanato, nigrescente et parum conspicuo, pilis minutissimis continuis, 20—40 ⩒ 5—6 μ. Asci cylindracei, 96—100 ⩒ 10—13 μ. Sporae elongatae, ad apices attenuatae, denique 7—11-septatae, 45—55 ⩒ 3—4 μ. Ad Eutypellam."

? var. *longipila* Starb. (Bot. Not. 1898 p. 218). Cfr. Sacc. Syll. XVI p. 602.

„undique pilis rigidis, fuscis, pellucidis, septatis, simplicibus, 50—100 ⩒ 4—5 μ passim obsessa, perithecia aureo-fulvescentia, ad ostiolum fuscoatra, asci 65—90 ⩒ 8—10 μ. Sporae filiformi-fusoideae, utrinque acutatae, simplices, guttulatae, 38—50 ⩒ 8—10 μ. Parasitica in Diatrype Stigma."

Hierher wird ein von Dr. v. Höhnel in meiner Sammlung befindliches Exemplar der *O. Briardi* gehören. Auch an unsern Exemplaren zeigen die aus 10 μ breiten Zellen gebildeten, im ganzen glatten Gehäuse unten manchmal vereinzelte, gerade, septierte, meist braune, —80 ⩒ 5 μ Haare. Schläuche keulig, 80—90 ⩒ 9—10 μ, 8-sporig. Sporen schmal spindelförmig, an beiden Enden ganz spitz, gerade oder schwach gebogen, 8—10-zellig mit Öltropfen, farblos, 35—40 ⩒ 3—4 μ, 2-reihig liegend. Paraphysen fädig, sehr sparsam.

(Betrachtet man diese Beschreibungen der verschiedenen Arten, so ergibt sich im allgemeinen ein ganz gleiches Bild, nur verschieden durch mehr oder weniger deutliche Behaarung der Perithezien und der bei var. *longipes* breiteren, undeutlich septierten Sporen. Sämtliche beschriebenen Arten bewohnen parasitisch das gleiche Substrat.)

1784. **Ascopolyporus polychrous** A. Möller (Phyc. et Ascom. Bras. 1901 p. 300 tab. III f. 41—42, tab. IV f. 57).

Cfr. Sacc. Syll. XVI p. 605.

Ad ramulos *Gaduae Taquarae* Ktz. Blumenau, Sta. Catharina, Brasilien. Leg. Dr. A. Möller, comm. Prof. P. Hennings.

1785. **Phyllachora paspalicola** P. Henn. n. sp.

On *Paspalum* sp. Parà, Brasilien. 15/5 1908. C. F. Baker.

1786. **Phyllachora Huberi** P. Henn. (Hedwigia 1900 p. 78).

Cfr. Sacc. Syll. XVI p. 620.

On *Hevea brasiliensis*. Parà, Brasilien. 1/1908. C. F. Baker.

(Auffällig ist das weit ausgebreitete Stroma, während Perithezienlager sich nur stellenweise zeigen. Die Sporen besitzen schmalen Schleimhof.)

1787. **Phyllachora dendroidea** P. Henn. n. sp.

On *Ficus* sp. Parà, Brasilien. 1/1908. C. F. Baker.

1788. **Phyllachora Bakeriana** P. Henn. n. sp.

On *Cassia Hoffmannseggii*. Parà, Brasilien. 5/1908. C. F. Baker.

1789. **Phyllachora flavo-cincta** Rehm (Hedwigia 1897 p. 370).

Cfr. Sacc. Syll. XIV p. 670.

Exs.: Rabh. Pazschke f. eur. 4164.

In foliis vivis Fruticis alicujus. Tubarão, Sta. Catharina, Brasilien. 1890. Ule, comm. Dr. Pazschke.

1790. ? **Dothidella placentiformis** Rehm (Hedwigia 1900 p. 234).

Cfr. Sacc. Syll. XVI p. 627.

Blätter einer Myrtacee. São Leopoldo, Rio grande do Sul, Brasilien. 12/1906. Dr. Rick S. J.

(Trotz der schönen Stromata kann ich in diesen nur ganz unausgebildete Schläuche finden und den Pilz demnach nicht bestimmt feststellen.)

1791. **Physalospora**? **varians** Starb. (Ark. Bot. 1904, 2 p. 18 f. 43—46).

Cfr. Sacc. Syll. XVII p. 584.

An lebenden Blättern von ?. São Leopoldo, Rio grande do Sul, Brasilien. 6/1908. Dr. Rick S. J.

(Unser Pilz stimmt im allgemeinen, besonders in der Beschreibung der Flecken, mit der Beschreibung bei Starbäck überein, hat auch „perithecia peripherice dispersa", aber nicht „in seriebus rectis vel curvatis partita" und nur 0,15 mm große Perithezien. Diese entwickeln sich in der Blattoberseite in rundlichen, zuerst schwach gelblichen, später völlig braunen und zart gelblich berandeten, c. 1 cm breiten Flecken, die auf der Blattunterseite viel heller gefärbt sind. Diese allmähliche Farbenänderung muß ihre Ursache in der Entwicklung eines auf das Chlorophyll einwirkenden eigentümlichen Enzyms haben.)

1792. **Physalospora perversa** Rehm (Exs. Rabenh.).

Cfr. Sacc. Syll. XIV p. 521.

Exs.: Rabh. Pazschke f. eur. 4162.

In foliis vivis *Araliacearum* spec. cujusdam. São Francisco, Sta. Catharina, Brasilia. 4/1885. Ule, comm. Dr. Pazschke.

1793. **Sphaerulina plantaginea** Rehm n. sp.

Perithecia in maculis epiphyllis orbicularibus, 2—3 mm lat. gregaria, demum arcte congregata, innata, globosa, poro pertusa, glabra, nigra, 120—130 μ, humida emergentia, excipulo crasso fusco parenchymatice contexto. Asci clavati, apice rotundati, crasse tunicati, —80 × 18—20 μ, 8-spori. J —. Sporae primitus obtuse clavatae et strato hyalino obductae, 1—3-septatae, hyalinae, demum subfusiformes, medio subconstrictae, extra ascum dilute fuscidulae, 20—30 × 8—9 μ, distichae. Paraphyses subramosae.

In foliis vivis *Plantaginis*. São Leopoldo, Rio grande do Sul, Brasilia. 10/1907. Dr. Rick S. J.

(Dürfte wohl zu *Pseudosphaeria* v. Höhnel (cfr. Fragm. myc. IV p. 25) zu stellen sein. *Mycosphaerella Puttemansii* P. Henn. (Hedwigia 1902 p. 301), cfr. Sacc. Syll. XVII p. 640, ebenfalls an *Plantago*-Blättern in Brasilien, hat nur 2-zellige Sporen, scheint aber im allgemeinen nahe verwandt.)

1794. **Gnomonia intermedia** Rehm n. sp.

Perithecia dispersa, plerumque folii superiore pagina innata, globulosa, nigra, tenuissime filiformiter rostrata, 120—150 μ diam., rostro glabro, c. 300 μ longo, 40 μ cr., subfusco, versus apicem obtusam hyalino. Asci clavati, teneri, 30—33 × 8—10 μ, 8-spori. Sporae biscoctiformes, utrinque obtusae, rectae, medio septatae, utraque cellula biguttulata, haud appendiculatae, hyalinae, 8—12 × 3,5—4 μ, distichae. Paraphyses nullae.

In foliis putridis *Betulae albae*. Neufriedenheim/München. 5/1908. Dr. Rehm.

(Obwohl mehrere *Gnomonia*-Arten auf Birkenblättern bekannt sind, vermag ich doch vorstehenden Pilz mit keiner derselben zu vereinigen. *Gn. setacea* (Pers.) Ces. et De N. hat Sporen 14—16 × 1,5—2 μ, *Gn. emarginata* Fuckel viel größere Perithezien mit langen rostra, zumeist an den Blattstielen sitzend. Leider sind meine Originalexemplare Fuckel's ohne Schläuche und Sporen, ebenso unbrauchbar Kunze f. sel. 252. Bei *Gn. campylostyla* Awd. beschreiben Winter Pyr. p. 580 und Schröter Schles. p. 390 die Sporen 22—24 × 4 μ, im Exs. Krieger f. sax. 1233 finde ich sie 18—20 × 4—5 μ. *Gn. petiolicola* (Fuckel) Karst. Exs. Fuckel f. rhen. 1788 hat die Sporen ungleichzellig geteilt.)

1795. **Mycosphaerella maculiformis** (Pers.) Schröter (Schles. Cr. III 2 p. 333).

var. **Pseudoplatani** Pass. Cfr. Sacc. Syll. IX p. 631, Schröter l. c.

An faulenden Blättern von *Acer pseudoplatanus* bei Neufriedenheim (München). 4/1908. Dr. Rehm.

1796. **Diatrype enteroxantha** (Berk.) Berl. (Icon. f. III p. 93 tab. 116 f. 1).

São Leopoldo, Rio grande do Sul, Brasilia. 5/1908. Dr. Rick S. J.

(Berlese l. c. sagt: „sub peridermio adest stroma effusum, aureum quoque, fere pruinosum, in quo substantia matricis valde mutata apparet et cum stromate pruinoso acervulorum continuum“, was ich bei diesen Exemplaren nicht finden kann, welche im übrigen sehr gut zur Beschreibung stimmen. *Diatrype chlorosarca* B. et Br. (Berl. Icon. f. III p. 93 tab. 115 f. 2) ist ganz nahe verwandt, besitzt jedoch c. 1 mm große stromata mit 6—10 1—2-reihig liegenden Perithezien, während bei unserem Pilz 12—15 Perithezien 1-reihig sich finden.)

1797. **Valsa ambiens** (Pers.) Fr. f. **Populi.**

Cfr. Winter Pyr. p. 729.

An dürren Ästen von *Populus pyramidalis.* Sonntagberg in N.-Österreich. 5/1906. P. Strasser O. S. B.

(Durch 12—15 ⩽ 3—4 μ große Sporen von *Valsa sordida* Nke. ganz verschieden. *Valsa populicola* Winter (Pyr. p. 729), Syn.: *Valsa populina* Fuckel (Symb. myc. Nachtr. I p. 26), Exs. Allescher & Schnabl f. bav. 448 hat 4-sporige Schläuche, Sporen 20 ⩽ 4 μ.)

1798. **Meliola arachnoidea** Speg.

Cfr. Sacc. Syll. IX p. 413, Gaillard Meliola p. 51.

Exs.: Rick f. austr. am. 138.

On *Cassia Hoffmannseggii.* Parà, Brasilien. 5/1908. C. F. Baker.

(Leider sind die Exemplare etwas dürftig entwickelt, da sie oft von dem Parasiten *Trichobelonium albosuccineum* Rehm besetzt sind.)

1799. **Meliola Psidii** Fr. (Linnaea 1830 p. 519).

Cfr. Sacc. Syll. I p. 63 (sub M. amphitricha), Rev. myc. 39 p. 138, Gaillard (Meliola p. 90 tab. XVI f. 3).

On *Psidium Guayava.* Parà, Brasilien. 1/1908. C. F. Baker.

(Gaillard gibt keine Maße der Schläuche und Sporen an. „Setae plus pallidae ad apicem“ stimmt bei unseren Exemplaren nicht.)

1800. **Zukalia paraensis** P. Henn. n. sp.

Auf der Oberseite der Blätter von *Anacardium occidentale.* Parà, Brasilien. 4/1908. C. F. Baker.

509*b*. **Pirottaea Veneta** Sacc. et Speg.

Cfr. Rehm Discom. p. 637.

An dürren Compositen-Stengeln bei Großhadern/München. 6/1908. Dr. Rehm.

331*b*. **Diaporthe orthoceras** (Fr.) Nke. f. **Achilleae** (Awd.).

An dürren Stengeln von *Achillea Millefolium* bei Großhadern/München. 8/1908. Dr Rehm.

225*c*. **Valsa translucens** (De N.) Ces. et DN.

Cfr. Schröter Schles. p. 406, Traverso fl. it. cr. II p. 105.

An dürren Weiden-Ästchen in der Birgsau (Algäuer Alpen). 9/1905. Dr. Rehm.

333*b*. **Diaporthe carpinicola** Fuckel (Symb. myc. Nachtr. II p. 37) 1873! Cfr. Winter Pyr. p. 631.

Exs.: Rehm Ascom. 333*a*, Rabh. f. eur. 2243 (sub Cryptospora bitorulosa v. Nießl), Kunze f. sel. 351 (sub Diaporthe decipiens Sacc.), Sydow Myc. march. 263 (sub Cr. bitorulosa), Sacc. Myc. Ven. 665 (sub Diaporthe Carpini), Fuckel f. rhen. 2660, Thümen Myc. un. 469.

Syn.: *Chorostate Kunzeana* (Sacc. Syll. I p. 607, 1876!, f. it. del. 1239) Traverso fl. it. cr. p. 200.

An dürren Ästen von *Carpinus Betulus* im Park Neufriedenheim/München. 8/1908. Dr. Rehm.

375*c*. **Diaporthe Salicis** (Fr.) Nke.

An dürren Ästen von *Salix Caprea* im Park Neufriedenheim/München. 8/1908. Dr. Rehm.

Neue Literatur.

Anderson, J. P. Jowa Erysiphaceae (Proceed. Jowa Acad. Sc. vol. XIV, 1908, p. 15—46, tab. 1—3).

Azoulay, L. Deux procédés faciles pour la détermination instantanée de la couleur des spores des champignons (Compt. Rend. Soc. Biol. vol. LXIV, 1908, p. 1).

Barrett, O. W. Cacao Pests (Agr. Soc. Trinidad and Tobago, 1907, 13 pp.).

Bernard, Ch. Bibliographisch Overzicht (Depart. van Landbrouw. Meded. van het Proefstation voor Thee. No. I, Buitenzorg 1908, 32 pp.).

Bernard, Ch. Ziekten der Theeplant (l. c. No. II, Buitenzorg 1908, 47 pp.).

Biffen, R. H. Studies in the inheritance of disease-resistance (Journ. Agric. Sc. II, 1907, p. 109—128).

Biffen, R. H. Rust in wheat (Journ. of the Board of Agricult. vol. XV, 1908, p. 241—253).

Brooks, Charles. The fruit spot of apples (Bull. Torr. Bot. Club vol. XXXV, 1908, p. 423—456, tab. 29—35).

Claussen, P. Zur Kenntnis der Kernverhältnisse von Pyronema confluens (Ber. Deutsch. Bot. Ges. vol. XXV, 1908, p. 586—590, 1 fig.).

Cruchet, D. Contribution à la flore mycologique suisse. Phycomycètes (supplément) et Ustilaginées vivant dans les plantes phanérogames entre Yverdon et le Jura, spécialement à Montagny (Bull. Soc. Vaudoise Sc. nat. vol. XLIV, 1908, p. 27—33).

Dauphin, J. Contribution à l'étude des Mortiérellées (Ann. Sc. nat. 9. Sér. Bot. vol. VIII, 1908, p. 1—112, 45 fig.).

Falk, Richard. Die Flugbrandarten des Getreides, ihre Verbreitung und Bekämpfung (Journ. f. Landwirtschaft vol. LVI, 1908, p. 173—182, 1 tab.).

Gard, M. Note sur un Oidium attaquant les feuilles de chêne (Compt. Rend. Soc. Biol. vol. LXV, 1908, p. 167—169).

Grafe, Victor. Atmung und tote Oxydation der Hefe (Allgem. Zeitschr. f. Bierbr. u. Malzfabrik. vol. XXXVI, 1908, p. 377—380).

Guéguen, F. Les champignons vénéneux et leurs caractères (Revue Scientifique 5. Sér. t. X, no. 11 (2. sém.), 1908, p. 323—328).

Guéguen, F. Toxicologie des Champignons. — Symptômes, causes et traitement des empoisonnements (l. c., p. 361—366).

Güssow, H. T. Septoria spot. A new fungus disease of tomatos (Gardener's Chronicle vol. XLIV, 1908, p. 121—122).

Hansen, Emil Chr. Recherches sur la physiologie et la morphologie des ferments alcooliques. XIII. Nouvelles études sur des levures de brasserie à fermentation basse (Compt. rend. des travaux du Laborat. de Carlsberg vol. VII, 3. livr., 1908, p. 179—217, 10 fig.).

Hartley, C. P. Some apple leaf-spot fungi (Science Sec. Ser. vol. XXVIII, 1908, p. 157—159).

Heald, F. D. Field work in plant pathology (Plant World vol. X, 1907, p. 104—109).

Hedgcock, G. G. Some stem tumors or knots on apple and quince trees (Bull. Dept. Agric. Washington 1908, 16 pp., 11 fig.).

Hennings, P. Fungi S. Paulenses IV a cl. Puttemans collecti (Hedwigia vol. XLVIII, 1908, p. 1—20).

Hennings, P. Fungi paraënses III (Hedwigia vol. XLVIII, 1908, p. 101—117).

Hennings, P. Fungi von Madagaskar, den Comoren und Ostafrika (Voeltzkow, Reise in Ostafrika in den Jahren 1903—1905. Band III. Stuttgart 1908, 33 pp., 2 tab.).

Hennings, P. Fungi philippinenses. I (The Philippine Journal of Sc. vol. III, no. 2, Sect. C, Botany, June 1908, p. 41—58).

Hiltner, L. Ueber die Organisation des Pflanzenschutzes in Deutschland (Prakt. Blätter f. Pflanzenbau vol. VI, 1908, p. 76—82).

Höhnel, Fr. v. Eumycetes et Myxomycetes in „Ergebnisse der Botanischen Expedition der Kaiserlichen Akademie der Wissenschaften nach Südbrasilien 1901. II. Band. Thallophyta und Bryophyta" (Denkschr. d. mathem.-naturw. Klasse d. Kais. Akad. d. Wissensch. Wien vol. LXXXIII, 1907, 45 pp., 1 tab.).

Kawamura, S. On Japanese Morchella (Bot. Mag. Tokyo vol. XXII, p. (206—(213)) — Japanisch.

Klebahn, H. Untersuchungen über einige Fungi imperfecti und die zugehörigen Ascomycetenformen. VI. Asteroma Padi DC. (Zeitschr. f. Pflanzenkrankh. vol. XVIII, 1908, p. 129—140, tab. IV—V) — VII. Leptothyrium alneum (Lév.) Sacc. (l. c., p. 140—154, tab. VI).

Kruyff, E. de. Untersuchungen über auf Java einheimische Hefearten (Centralbl. f. Bakteriol. etc. II. Abt. vol. XXI, 1908, p. 616—619).

Laubert, R. Der echte Mehltau des Apfelbaums, seine Kapselfrüchte und seine Bekämpfung (Deutsche landw. Presse vol. XXXV, 1908, p. 631).

Laubert, R. Pflanzenschutz in England (Prakt. Blätter f. Pflanzenbau u. Pflanzenschutz vol. IV, 1908, p. 56—57, 69—71).

Lemcke, Alfred. 1. Der amerikanische Stachelbeer-Mehltau und seine Verbreitung in Ostpreußen im Jahre 1907. 2. Bericht über die Frostschäden und die Auswinterung von Wintergetreide und Klee in der Provinz Ostpreußen im Winter 1906/07. (Königsberg i. Pr. [Gräfe & Unzer] 1908, 8°, 66 pp.)

Magnus, P. Gutes Gedeihen der nordamerikanischen Picea pungens in den Alpen und Übertritt eines einheimischen Rostpilzes auf dieselbe (Mitteil. Deutsch. Dendrolog. Gesellsch. 1907, p. 275—277).

Mangin, L. Formation normale et formation désordonnée des conidies chez les Aspergillacées (Compt. Rend. Acad. Sc. Paris vol. CXLVII, 1908, p. 260—263).

Marsais, P. Les traitements de l'oidium (Revue de Viticulture vol. XXIX, 1908, p. 629—632).

Marsais, P. Traitement d'hiver de l'Oidium (Revue de Viticulture vol. XXIX, 1908, p. 220—221).

Massee, G. Fungi exotici. VIII (Bull. misc. Inf. roy. bot. Gard. Kew 1908, p. 216—219).

Mattirolo, O. Species novae in excelsis Ruwenzori in expeditione Ducis Aprutii lectae. VI. — Mycetes (Annali di Botanica vol. VII, 1908, p. 143—145).

Meissner. Ueber die Wirkung einiger Bekämpfungsmittel der Peronospora und des Oidiums (Der Weinbau vol. VII, 1908, p. 46—47).

Moreschi, B. Come e organizzata, in Italia, la difesa della piante coltivate contro i nemici animali e vegetali (Boll. uff. Minist. Agric. Indust. e Commerc. VI, 1907, p. 32—45).

Mücke, M. Zur Kenntnis der Eientwicklung und Befruchtung von Achlya polyandra de Bary (Ber. Deutsch. Bot. Ges. vol. XXVIa, 1908, p. 367—378, 1 tab.).

Müller, Karl. Die Rebkrankheiten Peronospora und Oidium und ihre Bekämpfung (Wochenbl. d. Badisch. landw. Ver. 1908, p. 565—566).

Murrill, W. A. Boleti from western North Carolina (Torreya vol. VIII, 1908, p. 209—217).

Namyslowski, B. Wawalia regia, nov. subfam. gen. sp. — (Sur la structure et le développement de Wawelia regia nov. subfam. gen. sp.) (Bull. de l'Acad. Sc. de Cracovie 1908, p. 597—603, 6 fig.).

Namyslowski, B. Fungi novi aut minus cogniti (Kosmos 1908, p. 328—330).

Olive, E. W. Sexual cell fusions and vegetative nuclear divisions in the rusts (Annals of Bot. vol. XXII, 1908, p. 331—360, 1 tab.).

Petch, T. The genus Endocalyx, Berkeley and Broome (Annals of Bot. vol. XXII, 1908, p. 389—400, 1 tab.).

Potebnia, A. Etudes mycologiques. Sur les courants protoplasmiques dans les hyphes des champignons; Micromycètes des gouvernements de Koursk et Charkow (en russe) (Charkow 1907, 8°, 96 pp., 3 tab.).

Pringsheim, H. Ueber Pilzdesamidase (Biochem. Zeitschr. vol. XXII, 1908, p. 15—25).

Quanjer, H. M. Het „bladvuur" der komkommers veroorzaakt door Corynespora Mazei (Tijdschr. Plantenz. 1908, p. 78).

Raybaud, L. De l'influence de la lumière sur la végétation du Rhizopus nigricans (Compt. Rend. Soc. Biol. vol. LXIV, 1908, p. 1172—1174).

Reed, G. M. Infection experiments with Erysiphe Cichoriacearum DC. (Bull. Univ. of Wisconsin Sc. Series vol. III, 1908, p. 337—416).

Röll, J. Unsere eßbaren Pilze in natürlicher Größe dargestellt und beschrieben mit Angaben ihrer Zubereitung. 7. Aufl. (Tübingen, H. Laupp, 1908, 8°, 44 pp., 14 tab., 1 fig.)

Rouppert, C. Discomycetum species novae tres (Bull. de l'Acad. des Sc. de Cracovie. Classe des Sc. mathém. et natur. 1908, p. 649—651).

Sartory, A. et Jourde, A. Note sur le pouvoir des Sterigmatocystis nigra et St. carbonaria (Compt. Rend. Soc. Biol. vol. LXIV, 1908, p. 1135—1136).

Schander. Mitteilung der Hauptsammelstelle für Pflanzenkrankheiten am Kaiser Wilhelm-Institut über Getreideschädlinge (Westpreuss. landw. Mitt. vol. XIII, 1908, p. 125).

Scott, D. H. Arthur Lister, F. R. S. (Journal of Botany vol. XLVI, 1908, p. 331—334).

Spegazzini, C. Una nueva amenaza para los durazneros (Crónica Agrícola vol. II, 1908, p. 33—40, 5 fig.).

Tiraboschi, C. Ulteriori osservazioni sulle muffe del Granturco guasto (Annali di Botanica vol. VII, 1908, p. 1—31, tab. I).

Traverso, J. B. Flora Italica Cryptogama Pars I: Fungi. Vol. II fasc. 2. Pyrenomycetae (Sphaeriaceae allantosporae, hyalosporae, phaeosporae). Rocca S. Casciano. 1907, p. 353—492.

Trotter, A. Flora Italica Cryptogama Pars I: Fungi. Fasc. N. 4. Uredinales [Genera: Uromyces et Puccinia (in Compositis)]. Rocca S. Casciano. 1908, p. 1—144.

Zimmermann, A. Untersuchungen über das Absterben des Nadelholzes in der Lüneburger Heide (Zeitschr. f. Forst- u. Jagdwesen vol. XL. 1908, p. 357—391, 1 tab.).

Lindau, G. Lichenes peruviani, adjectis nonnullis columbianis (Engl. Bot. Jahrb. vol. XLII, 1908, p. 49—60).

Marc, F. Catalogue des Lichens recueillis dans le massif de l'Aigoual et le bassin supérieur de la Dourbie (Bull. Acad. Int. Géogr. bot. vol. XVII, 1908, p. 349—380).

Petersdorfer, A. Die Flechten des Bezirks Steyr in Oberösterreich (Steyr, 1908, 8°, 32 pp., 3 tab.).

Zschacke, H. Beiträge zu einer Flechtenflora des Harzes (Hedwigia vol. XLVIII, 1908, p. 21—44).

Referate und kritische Besprechungen[1]).

Giesenhagen, K. Bemerkungen zur Pilzflora Bayerns (Ber. bayer. bot. Ges. vol. XI, 1907, p. 163—170).

Enthält zwei Mitteilungen. 1. Über Trüffelfunde in Bayern. Verf. gibt eine historische Übersicht über in Bayern gefundene Trüffeln, fordert zu weiteren Untersuchungen auf und nennt *Tuber rufum* Pico (bei Garmisch gefunden) als neu für Bayern.

2. Über eine *Sclerotinia* in den Schläuchen von *Carex vesicaria*. Verf. fand dieselbe am Südende des Starnberger Sees, beschreibt sie genau und nennt sie *Scl. vesicaria* Giesenh. Die Fruchtkörper des Pilzes sprossen bereits im Herbste hervor.

Hennings, P. Fungi von Madagaskar, den Comoren und Ostafrika (Voeltzkow, Reise in Ostafrika in den Jahren 1903—1905. Band III. Stuttgart 1908, 33 pp., 2 tab.).

Es werden für die genannten Territorien 120 Arten genannt, größtenteils Basidiomyceten. Als neu beschrieben werden: *Tremella sakanensis*, *Peniophora subavellana*, *Stereum venosulum*, *Solenia pallido-cinerescens*, *Clavaria rosacea*, *Hydnum fenerivense*, *Poria Voeltzkowii*, *P. cinereo-umbrina*, *P. pseudosinuosa*, *Polystictus Turbo*, *Fomes pseudoconchatus*, *F. comorensis*, *Russula pseudopectinata*, *Hygrophorus pseudereus*, *H. gomphidioides*, *H. isabellinus*, *Pleurotus subsepticus*, *Lepiota mauritiana*, *Hypomyces niveus*, *Nectria sakanensis*, *Megalonectria madagascariensis*, *Cordyceps Voeltzkowii*, *Hypocrella palmicola*, *Xylaria mauritiensis*, *X. strobiliformis*, *Geopyxis granulosa*, *Lachnea rufobrunnea*, *Coniothyrium Coptospermae*, *Pestalozzia Coptospermae*.

Ferner wird *Voeltzkowiella madagascariensis* nov. gen. et spec. beschrieben. Der Pilz gehört zu den Bulgariaceen und ist mit *Sarcosoma* und *Bulgaria*

[1]) Die nicht unterzeichneten Referate sind vom Herausgeber selbst abgefaßt.

verwandt, aber durch das gelatinöse Myzel und durch die aus diesem oberflächlich entstehenden Fruchtkörper verschieden.

Die meisten der neuen Arten sind prächtig abgebildet.

Hennings, P. Fungi S. Paulenses IV a cl. Puttemans collecti (Hedwigia vol. XLVIII, 1908, p. 1—20).

Enthält die Bearbeitung einer weiteren Kollektion Pilze, die Puttemans in der brasilianischen Provinz Sao Paulo sammelte. Zahlreiche neue Arten aus allen Familien werden beschrieben.

Leider macht die Arbeit einen wenig sorgfältigen Eindruck. Abgesehen von den zahlreichen sprachlichen Inkorrektheiten in dem Gebrauche der lateinischen Sprache mag z. B. auf folgendes aufmerksam gemacht werden: Als neue Art beschreibt Verf. *Naemacyclus Styracis* und stellt diesen Pilz zu den Dothideaceen, während bekanntlich *Naemacyclus* eine Stictideen-Gattung darstellt. Nun geht aber aus der Diagnose deutlich hervor, daß es sich hier tatsächlich um eine Dothideacee handelt und zwar um einen Vertreter der ähnlich lautenden Gattung *Microcyclus!*

Ferner werden als neu beschrieben:

Gloeosporium Cattleyae auf pag. 16. Da jedoch schon ein *Gl. Cattleyae* Sacc. et D. Sacc. (Syll. fung. XVIII, p. 456) existiert, mag der brasilische Pilz *G. paulense* Syd. genannt werden.

Cercospora incarnata auf pag. 17. Es existiert bereits eine *C. incarnata* Ell. et Ev. (Sacc. Syll. fung. XIV, p. 1103). Ref. bezeichnet daher den Hennings'schen Pilz als *C. amoena* Syd.

Cercospora Caladii auf pag. 17. Da es bereits eine *C. Caladii* Cke. (Sacc. Syll. IV, p. 478) gibt, die nach der Diagnose von dem brasilischen Pilze verschieden ist, mag letzterer künftig als *C. nigritula* Syd bezeichnet werden.

Cercospora? Stachytarphetae auf pag. 18. Wir kennen bereits eine *C. Stachytarphetae* Ell. et Ev. (Sacc. Syll. XVI, p. 1070), die von dem Henningsschen Pilze ganz verschieden ist. Letzterer gehört jedoch, wie aus der Beschreibung hervorgeht, möglicherweise nicht zu *Cercospora*.

Unter anderem stellt Verf. drei neue Arten der Gattung *Uromyces* auf. Ref. untersuchte die drei Originalexemplare und fand:

Uromyces Rhapaneae P. Henn. n. sp. ist mit *U. Myrsines* Diet. identisch. Die Nährpflanze (übrigens nicht *Rhapanea*, sondern *Rapanea*) gehört zu *Myrsine*.

Urom. ingicola P. Henn. n. sp. ist synonym mit dem gleichnamigen *Urom. ingicola* P. Henn. in Hedwigia 1904, p. 157. Die vom Autor beschriebenen Uredosporen waren am Original nicht aufzufinden, die Teleutosporen sind falsch beschrieben.

Urom. Desmodii-leiocarpi P. Henn. n. sp. ist identisch mit *Urom. Hedysari paniculati* (Schw.) Farl.

Hennings, P. Fungi paraënses III. (Hedwigia vol. XLVIII, 1908, p. 101–117).

Die aufgeführten zahlreichen Arten wurden von C. F. Baker und Huber in der brasilianischen Provinz Para gesammelt. Viele Spezies werden als neu beschrieben.

Auch diese Arbeit leidet sehr unter der geringen Sorgfalt, die Verf. auf dieselbe verwendet hat. Beispielsweise wird auf pag. 114 eine neue Mucedineen-Gattung *Haplariopsis* P. Henn. beschrieben, obwohl bereits eine gleichnamige Gattung (cfr. Sacc. Syll. XVIII, p. 539) existiert. Es ist daher *Haplariopsis Cordiae* P. Henn. nov. gen. et spec. in Zukunft *Haplariella Cordiae* (P. Henn.) Syd. zu bezeichnen.

Auch *Phyllosticta Lucumae* P. Henn. und *Helminthosporium microsorum* P. Henn. sind bereits anderweitig vergebene Namen!

Höhnel, Fr. v. Eumycetes et Myxomycetes in „Ergebnisse der Botanischen Expedition der Kaiserlichen Akademie der Wissenschaften nach Südbrasilien 1901" II. Band. Thallophyta und Bryophyta (Denkschr. d. mathem.-naturw. Klasse d. Kais. Akad. d. Wiss. Wien vol. LXXXIII, 1907, 45 pp., 1 tab.).

Enthält die Bearbeitung der hauptsächlich von Wettstein und Schiffner in Südbrasilien auf der Expedition der Kaiserlichen Akademie der Wissenschaften im Jahre 1901 gesammelten Pilze, im ganzen 187 Arten, die sich auf alle Familien verteilen. Folgende 46 Spezies erwiesen sich als neu:

Basidiomycetes: *Cytidia Wettsteinii* Bres., *Discocyphella bambusicola*, *Wiesnerina horrida* nov. gen. et nov. spec. (zu den Thelephoraceen gehörig; die Gattung ist gewissermaßen eine mikroskopisch kleine *Peniophora* von eigentümlicher, bestimmter Form oder eine *Kordyana* oder *Kordyanella* mit typischen *Peniophora*-Cystiden), *Thelephora spadicea* Bres., *Th. Höhneliana* Bres., *Odontia palumbina*, *Laschia gemma*, *Poria avellanea* Bres., *Marasmius Schiffneri* Bres.

Pyrenomycetes: *Micropeltis Wettsteinii* auf Blättern von *Anemone Wettsteinii*, *Actinopeltis peristomalis* nov. gen. et nov. spec. auf Farnkrautwedeln (zu den Microthyriaceen gehörig und mit *Micropeltis* verwandt, aber durch die Form der Perithezien und das Vorhandensein eines Haarkranzes um das Ostiolum von dieser Gattung verschieden), *Nectria cinnabarina* var. *jaraguensis*, *N. imperspicua* auf *Panicum pilosum*, *N. lunulata* auf *Smilax*-Blättern, *N. Placenta* auf Rinde, *N. subbotryosa* auf Rinde, *Hypocrea bambusella* auf morschem Bambusrohr, *Dussiella violacea* auf Bambusrohr, *Fleischeria paulensis* auf Zweigen einer Melastomacee, *Hypocrella coronata* auf Myrtaceen-Blättern, *Lasiosphaeria subambigua* auf einem morschen Palmenstamm, *Melanomma Xylariae* auf *Xylaria polymorpha* schmarotzend, *Lentomita brasiliensis* auf Holz, *Rhynchostoma brasiliense* auf Holz, *Otthiella Schiffneri* auf Blättern, *Didymosphaeria bambusicola*, *Hypoxylon lichenicolum* auf sterilen Podetien von *Cladonia* schmarotzend, *Xylaria subinvoluta*, *X. lima*.

Discomycetes: *Cryptodiscus (Diplonaevia) volvatus* auf Rinde, *Stictis bambusella*, *Orbilia (Hyalinia) crenulato-lobata* auf Rinde, *Sarcosoma Wettsteinii* an einem Lianenstamm, *S. tetraspora* an morschem Holz, *Lasiobelonium aquilinellum* auf *Pteridium aquilinum*, *Helotium Bambusae*.

Phymatosphaeriaceae: *Microphyma graminicola* auf *Chusquea*-Blättern.

Sphaeropsideae: *Staurophoma Panici* nov. gen. et nov. spec. (von *Staurochaete* durch das Subiculum verschieden), *Vermicularia Cataseti*, *Capnodiastrum atrum* auf lederartigen Blättern, *Hendersonia Bignoniacearum*, *Peltistromella brasiliensis* nov. gen. et nov. spec. auf Blättern (von *Peltistroma* und *Phragmopeltis* durch die Zweizelligkeit der Konidien verschieden).

Melanconieae: *Pestalozzia Byrsonimae*.

Hyphomycetes: *Torula Lichenopsis* auf dem Thallus einer Krustenflechte, *Gibellula eximia* auf einer Schmetterlingspuppe, *Pseudogaster singularis* nov. gen. et nov. spec. auf Rinde (eine noch zweifelhafte, vielleicht zu den Hyalostilbeen gehörige Gattung), *Bactridium americanum*.

Zu manchen bekannten Arten werden ergänzende Diagnosen resp. sich auf die Synonymie beziehende Bemerkungen gegeben. Auf *Stilbum stromaticum* Berk. wird die neue Gattung *Stromatographium* begründet; die Synnemata entspringen bei diesem Pilze aus einem dicken, weichkohligen, gemeinschaftlichen Stroma in großer Anzahl.

Maffei, L. Contribuzione allo studio della micologia ligustica (Atti Istit. Bot. Pavia, 2. ser. XII, 1907, 16 pp., 1 tab.).

Verzeichnis von in der Provinz Ligurien neu beobachteten Pilzen, darunter als neu: *Massariella palmarum* auf Blättern von *Phoenix* und *Cocos*, *Ascochyta Cynarae* auf *Cynara Scolymus* und *Septoria Eriobotryae*.

Mattirolo, O. Seconda contribuzione allo studio della Flora ipogea del Portogallo (Bollet. da Soc. Broteriana vol. XXII (1906), p. 227—245, Coimbra 1907, 1 tab.).

Verf. berichtet über weitere, namentlich von A. F. Moller aus Portugal erhaltene Hypogaeen. Erwähnt werden:

Tuberaceae: Tuber lacunosum Matt., *T. aestivum* Vitt. (neu für Portugal), *T. Requieni* Tul. (neu für Portugal), *Terfezia Leonis* Tul., *Terf. Fanfani* Matt., *Choiromyces Magnusii* Matt.

Hymenogastreae: Hymenogaster Klotzschii, *Melanogaster variegatus* Tul.

Sclerodermaceae: Scleroderma verrucosum (Vaill.) Pers., *S. Cepa* (Vaill.) Pers., *Astraeus stellatus* (Scop.) Fisch., *Phlyctospora fusca* Cda.

Terfezia Fanfani, *Choiromyces Magnusii* und *Tuber Requieni* sind schön farbig abgebildet.

Mattirolo, O. Species novae in excelsis Ruwenzori in expeditione Ducis Aprutii lectae. VI. — Mycetes (Annali di Botanica vol. VII, 1908, p. 143—145).

Enthält die Beschreibungen folgender Novitäten: *Chaetomella Cavallii* Matt. auf Papier, *Hypoxylon crassum* Matt. et Sacc., *Cladoderris Roccati* Matt., *Favolaschia Cagnii* Matt., *Psilocybe Sellae* Bres. et Matt.

Außerdem wird als neue Gattung *Aloysiella* Matt. et Sacc. beschrieben, welche sich von *Melanopsamma* durch gefärbte Sporen unterscheidet. Einzige Art ist *A. ruwensorensis* Matt. et Sacc. auf lebenden Ästen von *Erica arborea*.

Sämtliche Arten wurden im Ruwenzori-Gebiet auf der Expedition des Herzogs der Abruzzen gesammelt.

Murrill, W. A. Boleti from western North Carolina (Torreya vol. VIII, 1908, p. 209—217).

Verf. beobachtete in North Carolina 1 *Boletinus*-, 27 *Boletus*-, 2 *Fistulina*- und 1 *Strobilomyces*-Art. Neu ist *Boletus Vanderbiltianus*.

Namyslowski, B. Wawelia regia, nov. subfam. gen. sp. — (Sur la structure et le développement de Wawelia regia nov. subfam. gen. sp.) (Bull. de l'Acad. Sc. de Cracovie 1908, p. 597—603, 6 fig.)

Auf Hasenkot entdeckte Verf. zu Krakau eine eigenartig gebaute Hypocreacee, die den Typus einer besonderen Unterfamilie bilden soll. Die Fruchtkörper erreichen eine Höhe von 5—12 mm und eine Breite von 1—2 mm; sie sind nach oben und unten verschmälert und tragen in der Mitte die oberflächlich aufsitzenden Perithezien. Die schwarzbraunen einzelligen Sporen liegen zu vieren im Schlauch. Die Keimung der Ascosporen konnte Verf. im hängenden Tropfen nicht beobachten, doch erhielt er durch Aussaat reifer Sporen auf Hasenkot neue Fruchtkörper. Auf mit Hasenkotdekokt getränktem Brot entwickelte der Pilz die zugehörige Konidienform und verkrüppelte Fruchtkörper ohne Perithezien.

Namyslowski, B. Fungi novi aut minus cogniti (Kosmos 1908, p. 328—330).

Beschreibung von *Septoria czarhonorica* n. sp. auf Blättern von *Doronicum cordifolium*, *S. Chrysanthemi-rotundifolii* n. sp., *Phyllosticta Wandae* n. sp. auf Blättern von *Dipsacus silvestris*, sämtlich in Galizien vorkommend.

Haplosporella Ribis Sacc. wird zu *Botryodiplodia* gestellt. Verf. fand diesen Pilz auch auf *Ribes mandschuricum* bei Krakau.

Es wäre wohl vorteilhafter gewesen, wenn sich Verf. des Gebrauchs der lateinischen Sprache enthalten resp. die Abhandlung besser auf die Ausmerzung der ziemlich zahlreichen Unkorrektheiten durchgesehen hätte.

Rouppert, C. Discomycetum species novae tres (Bull. de l'Acad. des Sc. de Cracovie. Classe des Sc. mathém. et natur. 1908, p. 649—651).

Verf. gibt lateinische Diagnosen von *Sphaerosoma Janczewskianum* n. sp. aus Polen, *Lachnea Chelchowskiana* n. sp. ebenfalls aus Polen und von *Cubonia Niepolomicensis* n. sp., welche im Laboratorium zu Krakau auf Hundekot auftrat.

Spegazzini, C. Una nueva amenaza para los durazneros (Crónica Agrícola vol. II, 1908, p. 33—40, 5 fig.).

Enthält Mitteilungen über tierische und pilzliche Schädlinge des Pfirsichbaumes in Argentinien. Als neue Arten werden *Phoma persicifila*, *Rhabdospora persicifila* und *Protomyces? persicifilus* beschrieben.

Bernard, Ch. Notes de Pathologie végétale. II. Sur quelques parasites de Citrus sp., Castilloa elastica, Thea assamica, Oreodoxa regia, etc. (Bull. du Départ. de l'Agricult. aux Indes Néerlandaises No. XI, 1907, 55 pp., 3 tab.).

Verf. beschreibt zunächst ausführlich ein auf *Citrus*-Blättern auftretendes neues *Capnodium* (*C. stellatum* n. sp.), welches sich von allen übrigen Vertretern dieser Gattung scharf unterscheidet. Die Fruchtkörper sind sternförmig gelappt, die einzelnen Lappen ihrerseits an der Spitze etwa fingerförmig geteilt. Diese sternartigen Gebilde erheben sich nicht senkrecht vom Substrat, sondern liegen denselben dicht an und variieren sehr in der Größe; sie können einen Durchmesser von $^1/_4$—5 mm erreichen. Nach den Untersuchungen des Verf.'s besitzt der eigentümliche Pilz verschiedene Pykniden- und Konidienformen und soll selbst zweierlei Perithezienformen (mit hyalinen und braunen Ascosporen) ausbilden.

Weiter werden Bemerkungen zu *Antennaria Castilloae* Zimm. und *Capnodium javanicum* Zimm. gegeben. Ersterer Pilz wird vom Verf. ebenfalls zu *Capnodium* gestellt. Als neu beschrieben wird *C. Guajavae* auf *Psidium guajava*.

Als *Stilbella Theae* n. sp. wird ein Pilz beschrieben, der in einer Plantage bedenklichen Schaden anrichtete. An den durch das Auftreten des Pilzes stark geschwächten Ästen siedelt sich bald *Helminthosporium Theae* n. sp. als sekundärer Parasit an.

Ein sehr häufiger Pilz in Java ist *Pestalozzia Palmarum*, den Verf. auf vielen Pflanzen aller Familien fand. Auf *Vamilla* trat *Nectria bogoriensis* n. sp., auf *Agleia odorata* und *Citrus* eine neue *Ramularia (R. undulata)* auf.

Bernard, Ch. Notes de Pathologie végétale. III. Sur quelques maladies des plantes à caoutchouc (Bull. du Départ. de l'Agricult. aux Indes Néerlandaises No. XII, 1907, 79 pp., 2 tab.).

Allgemein gehaltene Mitteilungen über die Schädlinge der Kautschuk liefernden Pflanzen, wie *Hevea brasiliensis*, *Ficus*, *Castilloa*, *Kickxia*, *Manihot* usw. Besonders ausführlich werden das gefährliche *Corticium javanicum* Zimm., eine Wurzelfäule der *Hevea*, ein *Fusicladium* usw. besprochen und Maßregeln zur Bekämpfung der pilzlichen wie tierischen Schädlinge gegeben.

Brooks, F. T. Notes on the parasitism of Botrytis (Proceed. Cambridge Philos. Soc. vol. XIV, pt. III, 1907, p. 298).

Aus den Versuchen des Verf.'s resultiert, daß *Botrytis*-Konidien gesunde grüne Blätter von *Lactuca sativa* nicht zu infizieren vermögen; selbst in künstlichen Kulturen gezogene und durch Nahrungsmangel ge-

schwächte Pflanzen werden nicht befallen. Hingegen bewirkten die Konidien an verletzten Blättern, die sich gelb zu verfärben begannen, eine Infektion.

Im Gegensatz zu den Konidien vermag saprophytisch ernährtes junges *Botrytis*-Mycel gesunde Blätter sofort zu infizieren.

Schander, H. Krankheiten des Beerenobstes, insbesondere die Ausbreitung des amerikanischen Stachelbeermehltaues in Deutschland und seine Bekämpfung. (Deutsche Obstbauzeitung, 1907, Heft 22 u. 23.)

Trotzdem *Sphaerotheca mors-uvae* erst im Jahre 1905 im Bezirk Bromberg festgestellt wurde, hat der Pilz 1906 und 1907 doch eine beängstigende Ausbreitung genommen. Neu bekannt von seinem Auftreten wurden 50 Fälle aus Ostpreußen, 180 aus Westpreußen, 500 aus Posen. In Westpreußen sind 94, in Posen 225 Ortschaften verseucht.

Die *Ribes*-Sorten sind gegen den Pilz sehr verschieden empfindlich. Es werden hierüber Mitteilungen gegeben. Die *Sphaerotheca* tritt außer auf *Ribes Grossularia* noch auf *Ribes rubrum, aureum, alpinum, atropurpureum* auf.

Hauptbekämpfungsmittel ist Vernichtung der befallenen Pflanzenteile und Bespritzung mit 0,4 % Schwefelkaliumlösung.

Brefeld, O. Untersuchungen aus dem Gesamtgebiete der Mycologie. XIV. Band: Die Kultur der Pilze und die Anwendung der Kulturmethoden für die verschiedenen Formen der Pilze nebst Beiträgen zur vergleichenden Morphologie der Pilze und der natürlichen Wertschätzung ihrer zugehörigen Fruchtformen. (Münster i. W. 1908, [H. Schöningh], 256 pp.)

Der Mykologe, der das Buch zur Hand nimmt, um darin eingehende Beschreibungen von Kulturmethoden einzelner Pilze und Pilzgruppen zu finden, wird nicht ganz auf seine Rechnung kommen. Denn gerade die Kulturmethoden, die Angaben über die bestimmten Pilzen zusagenden Substrate usw. sind allgemein gehalten, nicht selten verweist Verf. den Leser zwecks eingehender Beschreibung der Kultur verschiedener Pilzfamilien auf die vorhergehenden Bände. Ref. möchte vielmehr das Werk als ein Resumé des Verfassers betrachten über seine Lebensarbeit, die Morphologie der Pilze, ihre Verwandtschaftsverhältnisse und genetische Entwicklung klarzulegen, eine Arbeit, bei der Kultur und Kulturmethoden schließlich nur Mittel zum Zwecke waren. Besonders für den angehenden Mykologen bietet das Werk einen guten Wegzeiger, ihn in das Gebiet der Mykologie den richtigen Weg zu weisen.

Der erste Teil betitelt sich: Die Keimung der Pilzsporen und ihre erfolgreiche Kultur. Verf. gibt zunächt eine allgemeine Einleitung über die biologische Eigenart der Pilzsporen und ihre natürliche Verbreitung, über die Lebensweise der Pilze überhaupt und ihre Bedeutung in der Natur. Bei ihrer Kleinheit und Substanzarmut keimen die Pilzsporen in reinem Wasser in der Regel nicht, nur die größeren, mit etwas mehr Reservestoffen ausgerüsteten Formen vermögen dies oftmals, meist aber

ist das junge Mycel nicht von langer Lebensdauer. Bei den als Chlamydosporen bezeichneten Sporen ist aber die fruktifikative Auskeimung in reinem Wasser gerade die Regel und die natürliche Art der Auskeimung. Die Chlamydosporen sind aufzufassen als ein Dauerzustand einer angelegten Fruktifikation in Sporenform. Sie sind reichlich mit Reservestoffen ausgestattet, zur Vollendung der Fruktifikation, also zu ihrer Auskeimung genügt Wasser. Viele Sporen keimen erst nach kürzerer oder längerer Ruhepause. In manchen Fällen ist es das beste, sie an ihrem natürlichen Standorte, an Blättern usw., wo sie eben vorkommen, im Freien zu lassen, oder sie gemischt mit feuchtem sterilisierten Glassande an einem kühlen Orte aufzubewahren. Bei den Askomyceten und Basidiomyceten gibt es Fälle, „wo Fruchtkörperanlagen, bis zu einem bestimmten Punkte gefördert, ein Ruhestadium durchmachen, nach dessen Überwindung diese Fruchtkörper in bloßem Wasser ihre Entwicklung bis zum vollendeten Abschlusse fortsetzen." So z. B. die Fruchtkörper von *Penicillium* und anderer Pilze, die sich in Sklerotienform vom Muttermycel trennen und erst nach einer längeren Pause ihre Entwicklung in reinem Wasser bis zur Ascofruktifikation vollenden. Hierher sind auch zu rechnen die Rhizomorphen, z. B. von *Agaricus melleus*, deren ältere Teile in eine Art Ruhezustand übergehen, aus welchem sie nach erloschenem Spitzenwachstum meist nur in bestimmten Jahren zu den Fruchtkörpern auskeimen.

Die meisten an Nährstoffen armen Sporen sind für die Keimung und Entwicklung in bloßem Wasser nicht veranlagt, sie bedürfen der organischen Substanz, wie sie als Reste von Pflanzen und Tieren in der Natur vorkommt. Die Mehrzahl der Pilzsporen passieren nach Ansicht des Verf.'s den Tierleib, wohin sie durch das Futter gelangen und entwickeln sich auf den Fäkalien in üppiger Weise. Daher ist für viele Sporen Mistdekokt, z. B. aus Pferdefäkalien bereitet, eine ausgezeichnete Nährlösung, deren eventuellen Armut an Kohlehydrat eine Zugabe von Glykose beseitigt. Einigemal auf 60—80° erhitzt ist sie unbegrenzt haltbar. Für Pilze, die an Früchten vorkommen, sind als Nährlösungen brauchbar kalte Auszüge aus den getrockneten Früchten, besonders aus Pflaumen und Rosinen. Als drittes Medium ist Bierwürze zu betrachten, in der die meisten Pilze sehr gut gedeihen. Unter Umständen empfiehlt sich eine Mischung der drei Nährlösungen. Insektenbewohnende Pilze pflegen in Fleischextrakten gut zu gedeihen, für parasitische Pilze sind Nährsubstrate von den betreffenden Wirtspflanzen oft vorteilhaft. So wächst *Phytophthora* in einem kalten Auszuge junger getrockneter Kartoffeln, *Nyctalis* in Auszügen von *Russula*-Fruchtkörpern usw. Auch hier gibt es Sporen, die erst nach einer bestimmten Ruheperiode keimen, sie sind in feuchtem sterilisierten Glassande aufzubewahren. Nicht selten führt Anwendung verschiedener Temperatur zur Keimung. Ein nicht selten beschrittener Weg, zur Reinkultur eines Pilzes zu gelangen ist der, daß man Mycel-

stückchen oder Teile von jungen Fruchtkörpern als Ausgangspunkt wählt. Letzteres gelingt z. B. bei *Lycoperdon*, *Hydnum*, *Amanita* usw. In der Praxis benutzt man dieses Verfahren, indem man die Kulturen des Champignon nicht mit Sporen, sondern mit Mycelien anlegt. Zur Ausführung von Massenkulturen sind Massensubstrate nötig, von denen besonders sterilisierter Pferdemist geeignet ist. Daneben finden Verwendung Früchte aller Art, wie Pflaumen, Bananen usw., getrocknete Pilze und vor allem Brot, das man mit allen möglichen Extrakten tränken kann; es stellt, sterilisiert, das beste Massensubstrat vor, da es wegen seiner schwammigen Beschaffenheit die Luftzufuhr ermöglicht. Insbesondere ist es geeignet für Mucorineen. In manchen Fällen, besonders für holzbewohnende Pilze eignen sich recht gut nährstoffgetränkte Sägespäne. Die Gelatine ist infolge ihrer physikalischen Beschaffenheit als Substrat nicht besonders geeignet. In manchen Fällen aber leistet sie sehr gute Dienste, so z. B. zur Aussaat und Isolierung einzelner Sporen, zur handlichen Herstellung von Kulturen, zur Analyse von Wasser und Luft auf Pilzsporen.

Nebenumstände aller Art können bei der Kultur von Pilzen noch maßgebend sein, so vor allem Konzentration der Nährlösung, Feuchtigkeitsgehalt der Substrate, Mangel oder Überfluß an Licht, ebenso höhere oder niedere Temperatur.

Als Ausgangspunkt einer Kultur muß in der Regel die Objektträgerkultur betrachtet werden, die die Aussaat einer einzelnen Spore und ihre stete Beobachtung unter dem Mikroskop ermöglicht. Verf. erläutert die verschiedenen Arten der Objektträgerkulturen, die Isolierung der Sporen, ihre Kultur im hängenden Tropfen usw.

Für viele parasitisch lebende Pilze kommt oft als alleiniges geeignetes Substrat die betreffende lebende Wirtspflanze in Frage. Bei den Infektionsversuchen ist besonders zu achten auf das Eindringen der Infektionskeime in die Pflanze, auf ihr weiteres Schicksal usw. Vielfach gelingen Infektionen nur in einem gewissen Empfänglichkeitsstadium der Pflanze.

Der zweite Teil ist betitelt: Die Anwendung der Kulturmethoden für die verschiedenen Pilzformen nebst Beiträgen zur Biologie und vergleichenden Morphologie der Pilze und zur natürlichen Wertschätzung ihrer Fruchtformen. Die Schizomyceten behandelt Verf. kurz. Ihre Kultur gelingt leicht auf Gelatinenährböden. Für den Mykologen werden sie unangenehm, wenn sie in den Pilzkulturen auftreten, besonders sporenbildende Formen sind dabei beteiligt. Sie sind leicht auszuschalten durch 4–5maliges Erhitzen der Substrate auf 60°. Höhere Temperaturen sind zwecklos und nicht anzuraten, da die Struktur der Substrate, z. B. des Brotes, leidet.

Die Kultur der Myxomyceten ist meist leicht durchführbar in reinen bakterienfreien Nährlösungen, ebenso auch auf genügend feuchtem Pferdemist oder auf mit Mistdekokt getränkten Sägespänen.

Die fleischzersetzenden Phycomyceten lassen sich sehr leicht in Kultur nehmen, wenn man Fliegen, sterilisierte Fleischfasern usw. in Wasser bringt. Sie siedeln sich hier an und können in flüssigen Nährmedien sehr leicht kultiviert werden. Die Monoblepharideen, Leptomiteen, gewisse Saprolegniaceen, die pflanzlichen Detritus bevorzugen, gewinnt man leicht dadurch, daß man Früchte usw., irgendwie geschützt, in das Wasser ihrer natürlichen Standorte hängt. Von den Peronosporeen gelang nur bei *Phytophthora infestans* bislang die Kultur in Nährlösung. Von den der isogamen Differenzierung zuneigenden Entomophthoreen ist *Empusa* in der Regel leicht zu gewinnen. Die Infektion anderer Fliegen gelingt nur mit eben abgeschleuderten Konidien, ebenso bei *Entomophthora radicans*. Beide lassen sich in Fleischdekokt mit etwas Bierwürze kultivieren. *Conidiobolus*, *Basidiobolus* sind ebenso leicht in Kultur zu nehmen. Während nun bei diesen oogam differenzierten Phycomyceten die Anpassung an ein terrestrisches Leben wenig ausgeprägt erscheint und mehr den oogam differenzierten Algen gleicht, sind bei den isogam differenzierten Zygomyceten bereits vollendete Anpassungen an ein terrestrisches Leben ausgeprägt. Hier finden sich zum ersten Male Fruchtträger mit sehr kleinen, in der Luft leicht verstäubenden Konidiensporen. Die Zygomyceten sind im allgemeinen charakterisiert durch Ausbildung von Zygosporen, ihre spezielle Charakteristik ist jedoch begründet in der Vielgestaltigkeit der ungeschlechtlichen Fruktifikationen. Es finden sich hier Sporangien, reduzierte Sporangien (Fruktifikation in Konidien) und Chlamydosporen, die aufzufassen sind als Sporangienanlagen, die nicht direkt zur Fruktifikation kommen, sondern zunächst Sporengestalt annehmen, um erst späterhin ihren Lauf zu vollenden. Da die Dauerzustände dieser Formen bereits in der ungeschlechtlichen Fruktifikation vorhanden sind, so ist die Bildung der geschlechtlich entstehenden Zygosporen bei ihnen eine relativ seltene Erscheinung. Auf Grund seiner vor 30 Jahren angestellten Versuche wendet sich Verf. gegen die in neuster Zeit von Blakeslee aufgestellte Theorie, daß bei gewissen Mucorineen eine sexuelle Differenzierung dahin eingetreten sei, daß die ungeschlechtlichen Sporen homothallisch oder heterothallisch differenziert seien.

Die Kultur der Zygomyceten gelingt in der Regel ausnahmslos leicht auf allen möglichen Nährböden.

Aus den beiden Hauptfruchtformen der isogam differenzierten Phycomyceten, dem Sporangium einerseits, der Konidienfruchtform anderseits, lassen sich die Fruchtformen der höheren Pilze (Mycomyceten), der Askus und die Basidie, leicht ableiten. Das Sporangium wird zum Askus, die Konidie zur Basidie.

Basidiomyceten. I. Hemibasidiomyceten. Die Basidie ist hier in der Zahl der Ausbildung der Sporen noch nicht bestimmt und heißt Hemibasidie. Bei einzelnen Formen, z. B. *Ustilago grandis* und

bromivora, keimen die von den Hemibasidien gebildeten Konidien immer wieder zu neuen Hemibasidien aus, bei der Mehrzahl der Formen wird aber die Hemibasidie nur einmal gebildet, ihre Konidien besitzen aber die Eigenschaft, sich in Nährlösungen durch Sprossung fortgesetzt vermehren zu können. Diese Art vegetativ erscheinender, in Wirklichkeit aber fruktifikativer Bildung findet nur außerhalb der Nährpflanze statt, in der Nährpflanze geht der Pilz sofort zur Myzelbildung mit nachfolgender Brandsporenbildung über.

Die Keimung der Sporen läßt sich leicht in Nährlösungen erreichen; hier finden nur Konidiensprossungen statt, erst bei Erschöpfung des Nährmediums zeigt sich wohl ein Anfang von Myzelbildung. Diese tritt erst richtig ein in der betreffenden Nährpflanze, deren Infektion unschwer gelingt.

II. Protobasidiomyceten. Die Basidien der Protobasidiomyceten sind zu einer bestimmten Sporenzahl fortgeschritten. Bei den Uredineen können dreierlei Chlamydosporenformen vorkommen: Teleutosporen, Uredosporen und Aecidiosporen, von denen nur erstere fruktifikativ auskeimen, letztere vegetativ; außerdem treten noch Konidien in pyknidenartigen Fruchtlagern auf. Selten sind alle Fruchtarten auf einer Pflanze vorhanden, in der Regel sind sie auf zwei Pflanzen verteilt. Bei den Tremellineen werden die Basidien ohne Chlamydosporen gebildet, die in Lagern, Hymenien, auftreten. Sie lassen sich leicht in Bierwürze mit etwas Mistdekokt kultivieren, bilden aber nur Konidien aus. Nur bei *Dilacre Petersii*, einer Form mit geschlossenen Fruchtkörpern, lassen sich auch in Kultur auf Sägespänen Basidien erziehen.

III. Autobasidiomyceten. Die Exobasidii bilden die Basidien frei aus, ohne bestimmte Fruchtkörper zu erzeugen. Von ihnen läßt sich *Heptasporium gracile* Bref. in Nährlösungen bis zur Bildung von Basidien leicht kultivieren; dasselbe erreicht man bei verschiedenen Formen von *Corticium*. Von den gymnokarpen Autobasidiomyceten läßt sich *Dacryomyces* leicht bis zur Bildung von Basidien in Kultur halten, ziemlich leicht auch *Typhula*, wenig oder gar nicht *Clavaria*. Ein Übergang zu den angiokarpen Autobasidiomyceten sind die Thelephoreen, von denen einige holzbewohnende Arten der Kultur zugänglich sind. Während die Keimung der Hydneen-Sporen und ihre Kultur nicht gelingt, können zahlreiche Formen der Agaricineen auf geeigneten Nährböden zur Fruchtkörperbildung gebracht werden, so *Coprinus*- und *Collybia*-Arten auf Mist, die parasitischen *Nyctalis*-Arten in Pilzextrakten, die baumbewohnenden auf Sägespänen usw. Während die baumbewohnenden Polyporeen in großer Anzahl schon in Kultur genommen sind, haben Versuche mit erdbewohnenden bislang negative Ergebnisse gezeigt. Nicht selten sind ihre Sporen nicht keimfähig, irgendwie in ihrer Keimung angepaßt, und lassen sich vielleicht nur durch geeignete Behandlungsweise zur Keimung bringen. Nach einer Kritik der angeblichen

Sexualität der Basidiomyceten, wie sie insbesondere von Dangeard und Christman in neuster Zeit angegeben wird, geht Verf. über zu den

Ascomyceten. I. Hemiasci. Einen natürlichen Übergang von den sporangientragenden isogamen niederen Pilzen bilden die Hemiasci, bei denen der Askus noch nicht in typischer Weise ausgebildet erscheint. Die Saccharomyceten sind wohl anzusehen als Pilze, von denen wir nur die eine Vegetationsform in den Sproßkonidien, wie bei den Konidien der Brandpilze, nicht aber die andere Vegetationsform in Myzelien kennen. Ihre Stellung wird klar durch die Ausbildung endogener Sporen, also durch Bildung eines Sporangiums bzw. des Hemiaskus. Ihre Kultur ist allgemein bekannt.

II. Exoasce Ascomyceten. Eine natürliche Verbindung der Hemiasci und der exoascen Ascomyceten bilden *Endomyces*-Arten, die sich in Bierwürze leicht kultivieren lassen; hier ist die Zahl der Sporen im Askus schon eine typische, bestimmte. Die höchsten Formen dieser Klasse sind *Exoascus* und *Taphrina*. Ihre Askensporen vermögen in Nährlösungen hefeartig zu sprossen. Diese Konidiensprossungen sind hier unzweifelhaft zu einer Nebenfruchtform geworden.

III. Carpoasce Ascomyceten. Diese Klasse ist dadurch charakterisiert, daß eine Fruchtkörperbildung stattfindet, wobei die Hülle durch sterile Fäden gebildet wird, innerhalb der dann ein fertiler Initialfaden zur eigentlichen Fruktifikation schreitet. Sie lassen sich von den isogamen niederen Pilzen ableiten, deren Sporangienträger nicht unmittelbar am Myzel entstehen, sondern die fruktifikativen Ausläufer bilden, welche erst zu ihrer engeren Fruktifikation eine Gliederung und Differenzierung in sterile Fäden und fruktifizierende Sporangienträger erfahren. Man unterscheidet drei große Klassen, die Perisporiaceen, die Pyrenomyceten, die Hysteriaceen und Discomyceten. Leicht zugänglich der Kultur sind von Perisporiaceen die *Aspergillus*- und *Penicillium*-Arten, die auch durch hochentwickelte Konidienfruktifikation ausgezeichnet sind. Über die Biologie der Tuberaceen ist bislang fast nichts bekannt. Einen Übergang zu den Pyrenomyceten und Discomyceten stellen die Erysipheen dar, deren Perithezien schon eine Andeutung von Bilateralität zeigen, aber bei der Reife noch unregelmäßig aufreißen; über ihre Kultur ist nicht viel bekannt. Die meisten Pyrenomyceten bilden Nebenfruchtformen in Konidien aus, die in der Regel als *Fungi imperfecti* mit besonderen Namen bezeichnet werden. Eine große Anzahl von Formen sind noch diesbezüglich zu untersuchen, dabei ist es vorteilhaft, von den Askensporen auszugehen und sie in Kultur zu nehmen, da diese erfahrungsgemäß leicht zur Bildung der Nebenfruchtform übergehen, während dies umgekehrt seltener der Fall ist. Fast alle Pyrenomyceten sind leicht zu kultivieren.

Ähnlich wie bei den Pyrenomyceten tritt auch bei gewissen Formen der Discomyceten Nebenfruchtform in Konidien auf, jedoch viel seltener. Viele Formen sind leicht kultivierbar.

Die flechtenbildenden Ascomyceten lassen sich wie bekannt isolieren und weiter kultivieren. Weiter ist bekannt, daß man durch Beigabe der betreffenden Algenformen die Flechten künstlich erzeugen kann. Nach einem kurzen zusammenfassenden Rückblick auf die höheren Pilze bespricht Verf. eingehend noch die verschiedenen in neuerer Zeit gemachten Versuche, den höheren Pilzen Sexualität nachzuweisen.

Eichinger (Halle a. S.).

Hannig, E. Ueber pilzfreies Lolium temulentum. (Botan. Zeitg. vol. LXV, I. Abt. 1907, p. 25—38.)

Es gelang Verf., pilzfreie Früchte von *Lolium temulentum* zu erhalten, welche mehrere pilzfreie Generationen lieferten. Die chemische Untersuchung ergab in den pilzhaltigen Früchten die Anwesenheit eines Alkaloides, welches in den pilzfreien Früchten fehlte. Die Giftigkeit der *Lolium*-Früchte ist daher wohl sicher auf die Anwesenheit des Pilzes zurückzuführen.

Ritter, G. Ueber Kugelhefe und Riesenzellen bei einigen Mucoraceen (Ber. Deutsch. Bot. Ges. vol. XXV, 1907, p. 255—266, tab. X, 1 fig.).

Verf. bespricht zunächst seine an *Mucor racemosus* angestellten Versuche, die Kugelhefebildung künstlich nachzuahmen und geht dann zum Problem der Riesenzellenbildung über; ein günstigeres Objekt als *M. racemosus* für die Entstehungsbedingungen und Eigenschaften der Riesenzellen stellt *Mucor spinosus* v. Tiegh. dar. Ganz enorme und besonders charakteristische Riesenzellen lassen sich in zuckerhaltigen Lösungen mit anorganischen Ammonsalzen als Stickstoffquelle und geringen Mengen organischer Säuren erzeugen. Die spezielle Zusammensetzung solcher Lösungen wird angegeben.

Weiter schildert Verf. noch die morphologischen und physiologischen Eigenschaften der typischen Riesenzellen von *Mucor spinosus*. Auch *Rhizopus nigricans* und *Aspergillus niger* können durch Säuren zur Bildung von Riesenzellen veranlaßt werden.

Zellner, J. Chemie der höheren Pilze. Eine Monographie. (Leipzig, W. Engelmann 1907, 8°, 257 pp.)

Verf. betont in der Vorrede, daß er in dem vorliegenden Werke den Versuch mache, die Resultate übersichtlich darzustellen, welche die chemische Forschung bei der Untersuchung der „höheren Pilze" bisher gewonnen hat. Nach einer Einleitung gliedert sich der Inhalt in folgende Kapitel: 1. Mineralbestandteile, 2. Kohlenwasserstoffe, 3. Fette, 4. Lezithine, 5. Cholesterin und die Körper der Ergosteringruppe, 6. Alkohole, 7. Einbasische Säuren, 8. zwei- und mehrbasische Säuren, 9. Aminosäuren, 10. Körper der Harnstoff- und Purinreihe, 11. Basen, 12. Kohlehydrate und verwandte Körper, 13. Gerbstoffe, 14. Farbstoffe, 15. Harze und Terpene, 16. Eiweißkörper, 17. Fermente, 18. Toxine, 19. der Milchsaft der Pilze, 20. Nährwert der Pilze, 21. Chemische Zusammensetzung einiger

genauer untersuchter Pilzarten, 22. allgemeine Ergebnisse. Es folgen dann Nachträge, Register der botanischen Namen und Sachregister.

Auf den ungemein reichen Inhalt der einzelnen Kapitel an dieser Stelle näher einzugehen, verbietet der Raum. Aus den vom Verf. zusammengestellten allgemeinen Ergebnissen ist aber folgendes zu erwähnen: Vom chemischen Standpunkte aus lassen sich unter den Pilzen etwa folgende Gruppen unterscheiden: 1. Saprophytische. Humusbewohner (chemisch am besten bekannt), 2. Koprophyten, auf faulenden tierischen Auswurfstoffen lebend (sind chemisch noch wenig untersucht), 3. holzbewohnende Pilze, 4. Pflanzenparasiten (nur eine Art ist bisher chemisch genauer untersucht, nämlich das Mutterkorn), 5. Tierparasiten (zurzeit so gut wie keine chemischen Kenntnisse).

Die chemische Zusammensetzung der Pilze dürfte mit der ihres Substrates korrespondieren. Die Pilze sind aber in chemischer Hinsicht von ihrem Substrat in höherem Grade abhängig wie die grünen Pflanzen.

Die bisher konstatierten Eigenschaften, welche allen Pilzen gemeinsam sind, sind etwa folgende:

1. Die Pilzmembran besteht zum großen Teil aus Chitin oder einer dem Chitin sehr nahe verwandten Substanz (Fungin). Echte Zellulose und echte Holzsubstanz sind bisher niemals in Pilzen gefunden worden.

2. Chlorophyll fehlt stets und daher auch die Stärke.

3. Kohlehydrate dextrinartiger Natur oder Glykogen sind allgemein verbreitet, wenn auch in sehr wechselnder Menge.

4. Die Fette sind meist reich an freien Fettsäuren, enthalten stets Körper der Ergosteringruppe und meist auch Lezithine.

5. Von Eiweißkörpern sind wasserlösliche meist nur in geringer Menge enthalten.

6. Basische Körper sind vielfach verbreitet. Ein echtes Alkaloid ist in Pilzen nicht gefunden worden. Die bisher bekannten Basen stehen dem Trimethylamin nahe.

7. Farbstoffe sind allgemein verbreitet.

8. Desgleichen verschiedene Fermente.

Folgende Stoffe sind spezifische oder doch besonders charakteristische Pilzprodukte:

1. Stoffe, welche bisher nur in Pilzen gefunden wurden: Zwei Kohlenwasserstoffe, die Körper der Ergosterinreihe, Laktar-, Rhymovis-, Helvellasäure, zahlreiche Kohlehydrate, viele Farbstoffe, Harze (z. B. Agaricinsäure), mehrere Basen (Muskarin, Ustilagin, Ergotinin usw.).

2. Stoffe, welche im Pflanzenreiche auch sonst, aber doch nur selten gefunden wurden: Mykose (Trehalose), Inosit, Volemit, Propionsäure, Methylamin, Cholin, Guanin, Xanthin, Toxine.

3. Stoffe, welche sonst nur im Tierreich gefunden wurden: Glykogen, Harnstoff, Sarkin, Cetylalkohol, Chitin, Cerebrosid.

Die Darstellung des Verf.'s ist klar und prägnant und verliert sich nicht in Weitschweifigkeiten. Das bereits vorliegende literarische Material ist soweit als tunlich wiedergegeben; zahlreiche literarische Notizen sind in Fußnoten notiert.

Auf dem Gebiete der „Chemie der Pilze" sind noch manche Punkte nicht geklärt. Es ist mit ein Hauptverdienst des Verf.'s, hierauf hingewiesen zu haben und die Richtungslinien anzuzeigen, auf denen künftige Forschungen sich zu bewegen haben. Referent kann sich nur lobend über das Werk äußern.

Zellner, J. Zur Chemie der höheren Pilze. I. Mitteilung: Trametes suaveolens Fr. (Anz. Kais. Akad. Wiss. Wien 1907, p. 429).

Bei der chemischen Analyse von *Trametes suaveolens* wurde gefunden: Hoher Gehalt an Calciumsulfat, sehr geringe Menge von Phosphorsäure, Fett, ein fettspaltendes Ferment, zwei Körper der Ergosteringruppe, Mykose, Glukose, Harz, amorphe Kohlehydrate, ein Pentosan, glykosidspaltende, diastatische und invertierende Fermente, geringe Menge von Eiweißkörpern, ein anisartig riechender flüchtiger Stoff, ein grauer Farbstoff, ein wohl mit Amanitol identischer Körper, kleine Mengen flüchtiger Basen. Trehalose und Mannit sind nicht vorhanden.

Heinze, B. Über die Stickstoffassimilation durch niedere Organismen (Landwirtsch. Jahrb. f. wissensch. Landwirtsch. 1907, p. 889—910).

Im II. Abschnitt der Arbeit geht Verf. auf die echten Pilze ein. Es war früher behauptet worden, daß einige Pilzgruppen auch N zu assimilieren vermöchten, und man stützte sich hierbei auf analytische Daten. Verf. weist aber auf die Möglichkeit hin, daß die sehr geringen Stickstoffgehalte, die sich analytisch nachweisen lassen, doch innerhalb der Fehlergrenzen liegen. Wohl aber sind Pilze (z. B. *Dematium*-artige Schimmelpilze, Hefen) als sogenannte indirekte Stickstoffsammler anzusehen. Ihre Tätigkeit äußert sich wie folgt:

1. Sie vermögen den *Azotobacter*-Organismen C-Nahrung in Form von Mannit, Glykogen usw. und auch Salze verschiedener organischer Säuren zu liefern.

2. Sie binden wohl auch Ammoniak und verhüten, daß N in Form des Ammoniak entweicht.

3. Als Säurebildner können die Bodenpilze unlösliche Kalk- und Magnesia-Verbindungen in lösliche überführen und dadurch den Kulturpflanzen sehr nützlich werden.

Hörmann, P. Trennung der Kohlehydrate durch Reinhefen (Inaug.-Dissert. Münster 1907, 42 pp.).

Torula pulcherrima, *Saccharomyces Marxianus*, Jopenbierhefe, *Saccharomyces cerevisiae Lagos*, *Schizo-Saccharomyces Pombe*, *Sachsia suaveolens* und *Monilia variabilis* vergären oder assimilieren sehr stark Honigdextrine, dagegen nur sehr wenig Säure- und Malzdextrine.

Hefen eignen sich zur Trennung verschiedener Zuckerarten nur insoweit, als durch sie immer nur der von der Hefe nicht angegriffene Zucker bestimmt werden kann. Die Bestimmung des vergorenen Zuckers aus der gebildeten Kohlensäure durch Gewichtsverlust liefert kein genaues Resultat.

Verf. geht auf den Vorteil der Methode der Trennung der Dextrine von Zuckerarten durch Reinhefen gegenüber dem Alkoholfällungsverfahren ein. In erster Linie verdienen die Hefen Verwendung bei der Trennung der Glukose von der Maltose; sie sind unentbehrlich bei der Untersuchung von Stärkesirup und Stärkezucker. „Für die vollständige Analyse derselben eignen sich *Torula pulcherrima*, *Saccharomyces Marxianus* sowie die untergärige Bierhefe aus Danziger Jopenbier am besten."

Purvis, J. E. and **Warwick, G. R.** The influence of spectral colours on the sporulation of Saccharomyces (Proceed. Cambridge Phil. Soc. vol. XIV, 1907, p. 30—40).

Die Versuche wurden mit *Saccharomyces cerevisiae*, *S. ellipsoideus*, *S. intermedius*, *S. turbidans* und gewöhnlicher englischer Brauereihefe angestellt. Sie ergaben:

1. Die roten Strahlen oder Strahlen mit geringer Brechung beschleunigen die Sporenbildung im Verhältnis zu dem weißen Lichte.

2. Die grünen Strahlen scheinen die Sporenbildung zu verlangsamen.

3. Die blauen und violetten Strahlen verlangsamen die Sporenbildung noch mehr als die grünen Strahlen.

4. Die ultravioletten Strahlen wirken in dieser Beziehung noch intensiver und scheinen die Lebensfähigkeit der Zellen bei längerer Einwirkung herabzusetzen.

Takahashi, T. A new variety of Mycoderma yeast as a cause of sake disease (Bull. Coll. Agric. Imper. Univ. Tokyo. VII, 1907, p. 101—109).

Verf. beschreibt diese in verdorbenem Sake gefundene *Mycoderma*-Varietät, welche sich durch ihre große Resistenzfähigkeit gegenüber Alkohol und ihre Fähigkeit, Alkohol mit großer Energie zu Kohlensäure und Wasser zu oxydieren, auszeichnet; er nennt sie *Mycoderma saprogenes sake*.